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SUBRAMANIAM (L. S.). **Some new seedling diseases of Sugar-Cane.**—*Indian J. agric. Sci.*, vi, 1, pp. 11–16, 3 pl. (1 col.), 1936.

Among the fungi found on dying sugar-cane seedlings at the Coimbatore Cane Breeding Station in 1934 were two species of *Helminthosporium* and a *Pythium*, all parasitic. The seedlings attacked by the former were covered with narrow, reddish (later bright to dark brown) stripes and the leaf sheaths assumed a dark brown or olivaceous tinge owing to the formation of numerous conidiophores and conidia. One of the *H.* species was identified by its spore dimensions (20 to 104·5 by 9·5 μ, 3 to 11 septa) as *H. halodes*, a variety of which (*tritici*) has been described by Mitra on wheat in the Central Provinces [*R.A.M.*, x, p. 758]. *H. halodes* caused a very high percentage of infection, not only on different cane varieties but also on maize, sorghum, wheat, and barley, the grey lesions with reddish-brown borders on wheat resembling those due to *H. sativum*. This is believed to be the first record of *H. halodes* on sugar-cane. The second species appears to be identical with *H. tetramera*, isolated by McKinney from foot rots of wheat in the United States [ibid., v, p. 223; xiv, p. 622], and is a relatively weak parasite. No symptoms of *H.* infection were observed on selected seedlings from diseased pans on transplantation in the field.

The *P.* species causing root rot and collapse of very young seedlings was found to agree with *P. graminicolum* [ibid., xiv, p. 530], previously recorded on wheat in Bombay [ibid., viii, p. 34], but not hitherto observed on sugar-cane in India. Wheat, oats, and barley were actively parasitized in cross-inoculation tests, maize and sorghum being mildly attacked.

Evidence was obtained that infection is seed-borne on the susceptible P.O.J. 2725×Co. 243 variety; good control was given by seed and soil treatment with 0·25 per cent. uspulun both at Coimbatore and Pusa.

BRITON-JONES (H. R.). **Problems connected with root disease of Sugar-Cane in Antigua.**—*Trop. Agriculture, Trin.*, xiii, 1, pp. 5–8, 2 figs., 1936.

Sugar-cane root disease in Antigua is associated with a number of fungi, which the author regards as of no practical importance locally. That most commonly identified was *Marasmius sacchari* [*R.A.M.*, xii, p. 115]. The so-called red leaf sheath disease of Ba. 11569 sugar-cane in Antigua is an advanced stage of root disease of the *Marasmius* type and is not caused by *Sclerotium rolfsii* [ibid., ix, p. 808], which was,

however, observed on the leaf sheaths of closely planted B.H. 10(12) canes, and killing tissues at the nodes, including roots and buds. *Bacterium vasculorum* [ibid., xv, p. 397] is found on Ba. 11569, B. 2935, and B.H. 10(12) sugar-canes, but the author does not consider the disease to be of any great significance in Antigua.

Under local conditions the sugar-cane is planted in furrows in order to find soil moist enough to induce germination and to make the maximum use of subsequent light showers. The rainfall is extremely variable in Antigua, particularly in its distribution, with the result that the soil becomes too dry or too wet for satisfactory growth of the cane and root disease sets in. A field may be badly affected and give a poor yield, with a satisfactory one later. A change in the weather may bring about the recovery or the death of sugar-cane previously affected by root disease in the same growing season.

The paper concludes with notes on experiments that are to be carried out on soil tillage, drainage, fertilizers, and varietal qualities and with suggestions for small-scale trials of different methods of subsoil drainage.

GOIDÀNICH (G.). **Schema di una classificazione delle Stilbacee che erano riunite fin'ora nel genere Graphium Corda.** [A scheme of classification of the Stilbaceae hitherto included in the genus *Graphium* Corda.]—Reprinted from *Ann. Bot., Roma*, xxi, 1, 11 pp., 1935.

In this reclassification of the genus *Graphium* the author restricts the genus to species with branched synnematous hyphae, segregates those species with unbranched synnematous hyphae into *Nematographium* n.g., recognizes *Graphiopsis* Bainier for forms with pleurogenous conidia borne on spicules, and erects *Pleurographium* n.g. for forms with pleurogenous conidia borne directly on the hyphae [*R.A.M.*, xiv, p. 703].

LUND (A.). **Note on some Sumatran fungi.**—*Dansk bot. Tidsskr.*, xliii, 4, pp. 305–310, 3 figs., 1935.

Taxonomic notes are given on four fungi from a collection made by O. Hagerup in Sumatra during the years 1915–16, including *Aldona stella nigra* Rac., the black radiating apothecia of which occur on dark spots on the leaves of *Pterocarpus indicus*; and a new species of *Pestalozzia* named [with a diagnosis in English only] *P. arengae* n.sp., which was found on *Arenga saccharifera* leaves forming necrotic, greyish or brownish, dark-bordered lesions, up to 7 cm. long.

RIOFRÍO (B. F.) & FONT QUER (P.). **Bibliografia micològica de Catalunya o amb referències de fongs catalans.** [A bibliography of papers dealing with the mycology of Catalonia or containing references to Catalan fungi.]—*Cavanillesia*, vii, 10–12, pp. 168–172, 1936.

A list is given of some 50 titles of papers dating from 1913 dealing with the mycology of Catalonia or containing references to the fungi occurring in this province of Spain [cf. *R.A.M.*, vii, p. 407].

MASON (E. W.). **On Cercospora bloxami Berk. & Br.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 110–111, 1936.

In current literature two fungi are referred to as *Cercospora bloxami* Berk. & Br. [*R.A.M.*, xii, p. 546]. The first is especially associated with

white spot of turnip leaves in England and is the fungus officially recognized by the plant pathology sub-committee of the British Mycological Society in 1929 as *C. bloxami* Berk. & Br. Consideration of Roumeguère's Fungi sel. exsic. 5679 shows that it is also *Cylindrosporium brassicae* Fautr. & Roum. which von Höhnel in 1924 referred to *Cercosporella* as *C. brassicae* (Fautr. & Roum.) von Höhn. The second fungus is especially associated with the leaves of *Brassica oleracea* and *B. sinensis* in the tropics, and is apparently *Cercospora brassicicola* P. Henn. (though type material was not available to check this).

Cercosporella brassicae is white to the naked eye, the conidia being typically cylindrical and rounded at both ends. *Cercospora brassicicola* appears as blackish tufts to the naked eye, and each conidium, which typically tapers from the base to the apex, has a broad scar right across the base; brown conidiophores with corresponding broad scars are present.

The specimen at Kew labelled by Berkeley *Septoria bloxami* B. & Br. is clearly the type specimen of *Cercospora bloxami*, the fungus being, in fact, *Alternaria brassicae* (Berk.) Bolle, so that to neither of the fungi currently known as *C. bloxami* can this specific epithet be applied. Accepting *Cercosporella* as a valid genus the correct name for the first fungus is *Cercosporella brassicae* (Fautr. & Roum.) von Höhn. Von Höhnel, from a consideration of the diagnoses, surmised (probably correctly) that *Cercospora* (*Cercosporella*) *albomaculans* Ell. & Ev. (1894) [ibid., vi, p. 454; xv, p. 187] and *Ramularia rapae* Pim (1897) [ibid., iii, p. 688] were synonyms, pointing out also that *Cercospora bloxami* Berk. & Br. had multiseptate spores and was distinct.

Wakefield (E[lsie] M.) & Moore (W. C.). **Notes on certain changes in nomenclature in the second edition of the list of common names of British plant diseases.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 97–109, 1936.

In this paper explanations are given for most of the nomenclatorial changes adopted in the revised List of the common names of British plant diseases [*R.A.M.*, xiv, p. 325] now issued as a pamphlet by the Cambridge University Press. Apart from items already noticed the following changes occur: *Ustilago hordei* (Pers.) Kellerm. & Sw. is corrected to *U. hordei* (Pers.) Lagerh., *U. tritici* (Pers.) Jens. to *U. tritici* (Pers.) Rostr., *Helminthosporium avenae* (Bri. & Cav.) Eid. to *H. avenae* Eid. [ibid., xi, p. 294], and *Pyrenophora teres* (Died.) Drechsl. to *P. teres* Drechsl. [cf. ibid., xiv, p. 125]. *Thielaviopsis basicola* (Berk. & Br.) Ferraris (and not *Thielavia basicola* Zopf. [ibid., v, p. 393]) is commonly associated with the rotting of pea roots in Great Britain [ibid., xi, p. 623], and the disease due to this fungus is named black root to distinguish it from 'root rot' due to *Aphanomyces euteiches* Drechsl. *Colletotrichum oligochaetum* Cav. is corrected to *C. lagenarium* (Passer.) Ell. & Hals [ibid., xii, p. 418], *Marssonina panattoniana* Berl. to *M. panattoniana* (Berl.) Magn., *Venturia inaequalis* (Cooke) Aderh. to *V. inaequalis* (Cooke) Wint. emend. Aderh., *Physalospora cydoniae* Arn. to *P. obtusa* (Schw.) Cooke [see below, p. 472], *Plectodiscella veneta* Burkh. to *Elsinoe veneta* (Burkh.) Jenk. [ibid., xii, p. 771], *Sclerotinia gladioli* (Massey) Drayton to *S. gladioli* Drayton [ibid., xiii, p. 461], and

Gloeosporium ampelophagum is listed as a synonym for *E. ampelina* Shear. *Heteropatella valtellinensis* (Trav.) Wr. is adopted for *Pseudodiscosia dianthi* [ibid., ix, p. 247].

The three pea diseases caused by three distinct species of *Ascochyta* in America all exist in Great Britain. *A. pisi* Lib. produces leaf, stem, and pod-spotting only, and the name suggested for this is leaf and pod spot. The other two organisms, *Mycosphaerella pinodes* (Berk. & Blox.) Stone and *A. pinodella* (L. K. Jones), affect the plant in much the same way, but may attack the base of the stem, causing foot rot [ibid., xv, p. 273]. The two last-named, together with species of *Fusarium* frequently associated with a stem rot of peas in the west of England [ibid., xi, p. 144], are grouped together as the pathogens of a disease to which the name foot rot has been applied.

The name 'spraing' is retained for the potato disease exhibiting arc-like lesions, the term 'internal rust spot' being applied to the blotch type of lesion [ibid., xiii, p. 650]. Club root is adopted for the crucifer disease caused by *Plasmodiophora brassicae* in preference to finger-and-toe.

Turnip and swede soft rot, originally ascribed to *Bacillus carotovorus* L. R. Jones and *Pseudomonas destructans* Potter, is now attributed only to the former. The name of the onion and shallot downy mildew, usually known as *Peronospora schleideni* Unger, is corrected to *P. schleideniana* W. G. Smith [ibid., xii, p. 484]. As far as can be ascertained Smith first mentioned the oospores in 1884 under the name *P. schleideniana*, a combination made by de Bary in 1863, but invalid because applied instead of *P. schleideni* to the conidial stage.

The common name for the cabbage disease caused by *Phoma lingam* (Tode) Desm. is changed from stem rot to canker.

Myxosporium corticolum is altered to *M. corticola*, the latter word being a noun used in apposition with the former. The fungus was first described as *Dermatea corticola* Arn. [ibid., xv. p. 202], and named by Jørgensen, who was unaware that it had been recorded before *Neofabraea corticola*; Nannfeldt considers *Neofabraea* synonymous with *Pezicula* and has called the apple fungus *P. corticola* (Jørgens.) Nannf. If this synonymy be correct, the proper citation is *P. corticola* (Arn.) Nannf.

The correct authority for the name *Penicillium gladioli* is McCull. & Thom [ibid., vii, p. 448] as given in the first edition of the list, and not *P. gladioli* Machacek as in the second, since the former name ante-dated the latter by four days.

In view of Miss Waterman's conclusions that *Coniothyrium fuckelii* Sacc. and *C. rosarum* Cooke & Harkn. are identical [ibid., ix, p. 722], rose graft disease previously attributed to the latter has been omitted from the list, stem canker now being attributed to *Leptosphaeria coniothyrium* (Fuck.) Sacc. [ibid., xiv, p. 313]; the so-called brand canker due to *C. wernsdorffiae* Lanb. has not yet been found in England.

In the first edition *Viola* and violet leaf spot was attributed in part to *A. violae* Sacc. & Speg., but the evidence indicates that the fungus commonly causing violet leaf spot in England does not correspond to the original description; it seems to agree closely with that of *Phyllosticta violae* Desm., to which it is provisionally referred.

HUNTER (LILLIAN M.). **The genus Milesia in Great Britain and Ireland.** —*Trans. Brit. mycol. Soc.*, xx, 2, pp. 116–119, 1936.

In studies conducted in England in 1933–4 on the life-histories of species of *Milesia* [*R.A.M.*, xiv, p. 410] the author in artificial inoculations with basidiospores from the teleutospores on the fern hosts obtained the spermagonia and aecidia of the following species for the first time, viz.: *M. scolopendrii* from *Scolopendrium vulgare* on *Abies alba* and *A. concolor*, *M. polypodii* from *Polypodium vulgare* on the same two hosts, *M. vogesiaca* from *Polystichum angulare* on *A. alba*, and *M. kriegeriana* from *Dryopteris spinulosa* and *D. filix-mas* on both the foregoing hosts as well as on *A. grandis*. In all these species of *Milesia* the spermagonia appeared from 21 to 30 (average 23) days from the time of inoculation. The time required from the date of inoculation for the appearance of the aecidia varied with the species from 46 to 99 days.

In Great Britain and Ireland hitherto unreported collections of *Milesia* spp. include *M. blechni* on *Blechnum spicant*, *M. carpatica* on *Dryopteris filix-mas*, *M. kriegeriana* on *D. filix-mas*, *D. spinulosa*, and *D. spinulosa* var. *dilatata*, *M. murariae* on *Asplenium ruta-muraria*, *M. polypodii* on *Polypodium vulgare*, *M. scolopendrii* on *Scolopendrium vulgare*, and *M. vogesiaca* and *M. whitei* on *Polystichum angulare*.

HUNTER (LILLIAN M.). **The life histories of Milesia scolopendrii, M. polypodii, M. vogesiaca and M. kriegeriana.**—*J. Arnold Arbor.*, xvii, 1, pp. 26–37, 1 pl., 1936.

In this further paper dealing with her studies on the genus *Milesia* in Great Britain and Ireland [see preceding abstract] the author gives full descriptions [without Latin diagnoses] (from her culture material on *Abies*) of the newly discovered spermagonia and aecidia of *M. scolopendrii*, *M. polypodii*, *M. vogesiaca*, and *M. kriegeriana*. The spermagonia of the last two species are distinguishable from one another and from those of *M. scolopendrii* and *M. polypodii* by their form and size, while those of *M. scolopendrii* and *M. polypodii* are similar in these respects.

BOSE (S. R.). **Bengal Polyporaceae.**—Reprinted from *Proc. Indian Sci. Congr., 1936*, 29 pp., 1936.

Following some introductory remarks, the author discusses the geographical distribution of the Polyporaceae in Bengal [*R.A.M.*, xiv, p. 794], the conditions promoting their development, their morphology, taxonomy, and anatomy, the general structure, nutrition, cytology of reproduction, and chemical nature of the fruit body of *Ganoderma lucidum* [ibid., xiv, p. 693; xv, p. 78], some biological peculiarities of Polypores, their physiology, medicinal properties, and other uses. A bibliography of 65 titles is appended.

MOORE (E[NID] S.) & RETIEF (D. F.). **Mildew or white rust of Tobacco.**—*Fmg S. Afr.*, xi, 118, p. 31, 1 fig., 1936.

A popular note is given on mildew or white rust of tobacco [*Erysiphe cichoracearum*: *R.A.M.*, xv, p. 425], in connexion with the increasing

importance of which in South Africa the following system of priming is recommended. The operation should be commenced when the plants are about 12 in. high, and at suitable intervals thereafter the lower leaves should be removed, a few at a time, until the crop has been topped and is about to mature, when all the leaves to a height of some 12 in. from the ground should be taken off; the lowest leaves remaining must not actually touch the ground. Systematic priming on these lines facilitates the free circulation of air round the plants and thus checks the advance of the fungus at its onset.

ALEXANDER (L. J.). **Progress in the development of a new Tomato variety resistant to leaf mold.**—Abs. in *Phytopathology*, xxvi, 2, p. 86, 1936.

Failure to secure either parental type from crosses between individuals of the small-fruited, homozygous lines of tomato resistant to leaf mould [*Cladosporium fulvum*: *R.A.M.*, xiv, pp. 202, 684; and below, p. 480] and of the large-fruited, homozygous susceptible variety, Globe, necessitated protracted experiments [in Ohio] in back-crossing and selection. At present a number of selections, still heterozygous for resistance, produce an abundance of high-grade fruit, apparently equal to Globe in size. F_1 individuals resulting from crosses between homozygous resistant and homozygous susceptible parents are uniformly resistant, while those of the F_2 progenies segregate into a ratio approximating to 3 resistant : 1 susceptible. Progeny tests with 82 F_2 plants yielded 19 homozygous resistant, 42 heterozygous resistant, and 21 homozygous susceptible offspring. F_1 plants derived from crosses between heterozygous resistant and homozygous susceptible parents segregate for resistance into a ratio approximating to 1 : 1. In progeny tests, with 122 F_1 plants 59 of the resulting offspring were heterozygous for resistance and 63 homozygous for susceptibility.

HEPTING (G. H.). **Decay following fire in young Mississippi Delta hardwoods.**—*Tech. Bull. U.S. Dep. Agric.* 494, 32 pp., 4 pl., 2 figs., 16 graphs, 1935. [Received May, 1936.]

During 1932, 602 fire-scarred trees (3 to 11 in. in diameter) of 9 species of Mississippi Delta hardwoods were dissected and analysed for decay [cf. *R.A.M.*, xv, p. 409]. It was ascertained that decay spread upwards from the fire scar most rapidly in oak (2·3 in. per year), followed in order by ash, red gum (*Liquidambar styraciflua*), hackberry (*Celtis laevigata*), and persimmon (*Diospyros virginiana*). A definite relationship was established between the rate of decay and each of the following: age of tree, percentage of tree circumference scarred, diameter at times of scarring and examination, and causal organism of the decay.

Cultures were prepared from 251 of the decayed trees, and of these 171 yielded apparently pure cultures of decay fungi; only twice did two cultures taken from the same tree give two different Hymenomycetous fungi, thus showing only one fungus to be responsible for the major decay in any one tree. The fungi found causing decay were *Hydnum erinaceus* [ibid., i, p. 443], an unidentified yellow Hymenomycete, *Polyporus lucidus* [*Ganoderma lucidum*: ibid., xiv, p. 693], *P. fissilis*, *Pleuro-*

tus ostreatus [ibid., xii, p. 343], *Lentinus tigrinus* [ibid., xii, p. 411], two white Hymenomycetes, *Fomes geotropus* [ibid., ix, p. 421], and *P. zonalis* [ibid., vi, pp. 274, 608]. The principal cultural characters of the more important of these fungi are mentioned. The greatest annual rate of decay was caused by *H. erinaceus* (3·5 in. on trees with an average scar age of 23 years), while the unidentified yellow Hymenomycete, found only in overcup oak (*Quercus lyrata*), progressed almost as fast. *F. geotropus*, the fungus most commonly isolated, showed an average progress of 2 in. per annum on trees with an average scar age of 11 years.

Wilkins (W. H.). **Studies in the genus Ustulina with special reference to parasitism. II. A disease of the common Lime (Tilia vulgaris Hayne) caused by Ustulina.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 133–156, 1 pl., 8 figs., 1936.

In this second instalment of the author's studies on *Ustulina* [*R.A.M.*, xiii, p. 597] it is stated that a lime tree (*Tilia vulgaris*) brought down by the wind at Oxford showed the presence of *U. vulgaris* [ibid., xiv, p. 667] on the surface of the exposed wood of an old wound in the trunk. Artificial infection with the isolated fungus on healthy living trees and sound wood produced symptoms identical with those present in the infected tree, the organism being reisolated, while inoculations on the lime with a culture from authentic *U. vulgaris* spores produced the same symptoms.

The exposed wood of the wound was soft and rotted, but the rest of the trunk, seen from the outside, appeared to be normal. Internally the wood was discoloured to a height of about 24 ft. from the ground, but was only decayed to a height of about 16 ft.; the latter was friable and abnormally light in weight and colour and delimited from the former by a black line. The mycelium penetrated the whole of the diseased and discoloured areas and black lines also occurred indiscriminately throughout the diseased wood.

It is concluded that *U. vulgaris* can cause a very definite disease of standing lime, and should be regarded as a wood-destroyer producing a white rot that may render the timber commercially worthless as well as completely killing the tree. The disease appears to belong to Campbell's group 2 [ibid., xii, p. 343] of the white rots of wood.

Bavendamm (W.). **Der Rindenbrand der Pappeln.** [The bark blight of Poplars.]—*Tharandt. forstl. Jb.*, lxxxvii, 2, pp. 177–179, 1 fig., 1936.

Bark blight of poplars (*Dothichiza populea*, probably the pycnidial stage of *Cenangium populeum*), already reported from Westphalia, Baden, Württemberg, Hanover, Brunswick, and East Prussia [*R.A.M.*, xiii, p. 480], has now made its appearance and started to spread rapidly in Saxony. Quickly growing species, such as *Populus canadensis*, *P. robusta*, *P. eugenei* [*P. monilifera*], *P. simonii* [*P. balsamifera*] and its var. *fastigiata*, *P. brevifolia*, *P. petrowskiana* [*P. canadensis*], and *P. nigra* var. *italica* suffer the most, while *P. alba* and *P. tremula* do not seem to be affected. Good results are reported to have been obtained in nurseries by three to four applications of 2 per cent.

Bordeaux mixture as the trees are coming into leaf, but no systematic scheme of control has yet been formulated in the case of this disease.

FOWLER (M. E.). **Sphaeropsis malorum on Abies concolor.**—*Plant Dis. Reptr*, xx, 2, pp. 30–31, 1936. [Mimeographed.]

A species of *Sphaeropsis* agreeing with the description of *S. malorum* Peck [*Physalospora obtusa*: *R.A.M.*, xv, p. 33], reported by N. E. Stevens as an agent of apple black rot [ibid., xiii, p. 312], was isolated from dying *Abies concolor* trees, weakened by unsuitable cultural practices in Maryland. Apples were inoculated with monoconidial cultures both of this organism and of a species of *Sphaeropsis* isolated from Austrian pine [*Pinus laricio* var. *austriaca*] in the same State, the latter being apparently identical with *S. ellisii* [ibid., xv, p. 408] and having conidia measuring 29 to 39 by 13 to 17 μ compared with 20 to 28 by 9 to 14 μ for those of the *Abies* fungus. Both organisms induced a typical black rot of apples, and were recovered from the diseased tissues. *S. malorum* Peck does not appear to have been previously recorded on firs, though it is known to attack other conifers.

TUBEUF [C. v.]. **Verlauf und Erfolg der Erforschung der Blasenrostkrankheit der Strobe von 1887 bis 1936.** [The progress and outcome of research on blister rust disease of *Pinus strobus* from 1887 to 1936.]—*Z. PflKrankh.*, xlvi, 2, pp. 49–103; 3–4, pp. 113–171, 23 figs., 2 maps, 1936.

The history of the writer's constant efforts (which are still proceeding) to secure effective legislation against the blister rust (*Cronartium ribicola*) of *Pinus strobus* and other pines since its introduction into Germany in 1887 is traced in the form of a diary [*R.A.M.*, xiv, p. 666]. Appendices are added in which are discussed, with extended references to the literature, various aspects of the disease, including its life-history, the development of the disease in America and on *Pinus cembra* in the Tatra mountains [Czecho-Slovakia] and the studies by the author and E. Lechmere of the parasitism of *Tuberculina maxima* [ibid., xv, p. 331] on *C. ribicola* (reprinted from *Naturw. Z. Forst- u. Landw.*, p. 484 *et seq.*, 1914). The present paper is largely controversial and deals with the author's failure to enlist the understanding and co-operation of his colleagues in his aims.

LIESE (J.). **Beiträge zum Kiefernbaumschwammproblem.** [Contribution to the Pine tree fungus problem.]—*Forstarchiv*, xii, 3, pp. 37–48, 5 figs., 1 graph, 1 map, 1936.

The writer summarizes and discusses the observations made by himself and others on various aspects of the disease caused by *Trametes pini* on pine, larch, and other conifers [*R.A.M.*, xiv, p. 663] in Germany. The fungus predominates in the easterly regions with a mean annual rainfall below 600 mm. and chiefly attacks trees with extensive heartwood formation. Infection of the living tree takes place only through the heartwood branch stumps and is followed by the formation of a protective zone of wood, composed of dead cells with an abundance of resin, separating the living from the dead portions. The

restriction of *T. pini* to trees over 30 years old is due to the absence of the necessary heartwood material in the branches of younger ones. Once established in the heartwood the fungus is able to migrate to the sapwood. The infected areas of the heartwood turn first reddish, later yellowish-brown; the middle lamella is the first part to disintegrate, and this process results in the collapse of the cells into holes containing remnants of cellulose. Even in an advanced stage of decay the affected wood is remarkably firm compared with that infected by saprophytes and may be used for a number of purposes.

The minimum, optimum, and maximum temperatures for the development of *T. pini* are 5°, 25°, and 32° C., respectively, its daily growth in length in pure culture at 25° being 2·5 mm. as against 1·6 mm. at room temperature; in nature the fungus may develop at the rate of 20 to 25 cm. a year under favourable conditions, probably on an average about 18 cm.

The possibility of combating the fungus by the injection of water-soluble fluorides and by appropriate silvicultural practices is briefly discussed.

Observations en matière forestière en 1934. [Observations on forest matters in 1934.]—*Bull. Soc. for. Belg.*, xliii, 1, pp. 23–31, 1936.

In the section of this paper dealing with fungal diseases of forest trees in Belgium it is stated that during 1934 oak mildew (*Oidium quercinum*) [*Microsphaera quercina*: *R.A.M.*, xv, p. 63] was much less prevalent and caused little damage. *Peridermium strobi* [*Cronartium ribicola*: ibid., xv, p. 330] occurred sporadically all over Belgium on Weymouth pine [*Pinus strobus*]; *Polyporus* [*Fomes*] *fomentarius* [loc. cit.] was found occasionally on beeches in the forest of Soignes; the ring disease of conifers (*Armillaria mellea*) [associated with *Rhizina undulata* and *F. annosus*: ibid., xii, p. 798] continued to cause damage in a number of districts; *Lophodermium pinastri* [ibid., xv, p. 267] was appreciably less prevalent; and *Peridermium pini* [var.] *acicola* [ibid., vi, p. 201; vii, p. 415] affected young pine plantations, though much less severely than in the three preceding years.

Georgescu (C. C.) & Badea (M.). **Căderea acelor de Juniperus, cauzată de o ciupercă nouă Camarosporium juniperinum Georgescu et Badea nov. sp. Comunicare prealabilă.** [Needle fall of *Juniperus* caused by a new fungus, *Camarosporium juniperinum* Georgescu & Badea nov. sp. Preliminary note.]—*Rev. Pădurilor*, xlvii, 3, pp. 155–162, 8 figs., 1935. [French and German summaries.]

Camarosporium juniperinum n. sp., found causing needle fall of *Juniperus communis* in the Bretcu (Eastern Carpathian) mountains, Rumania, is characterized by subepidermal, spherical, ostiolate pycnidia, up to ½ mm. in diameter, occurring in pairs on either side of the midrib on the upper surface of the dead needle; olive-brown peridia; olive-brown, oval spores, rounded at both ends, with 7 transverse and 3 longitudinal septa, 22 to 23 by 9 to 10·5 μ; and uniseptate conidia arising by terminal constriction from the papillae surrounding the ostiole.

GOIDÀNICH (G.). **Nuovi casi di tracheomicosi da 'Verticillium' in Italia. Osservazioni su una specie nuova di 'Verticillium' tracheicolo.** [New cases of tracheomycosis caused by *Verticillium* in Italy. Observations on a new species of tracheid-inhabiting *Verticillium*.] —*Boll. Staz. Pat. veg. Roma*, N.S., xv, 4, pp. 548–554, 1935. [Received April, 1936.]

Notes are given on the occurrence of *Verticillium albo-atrum* causing tracheomycosis [*R.A.M.*, xiv, p. 265; xv, p. 129] on new hosts in Italy.

A single case of verticilliosis of the elm (*Ulmus campestris*) [ibid., xiv, pp. 406, 664] was observed near Potenza, the external and internal symptoms of which resemble closely those due to *Graphium* [*Ceratostomella*] *ulmi* [ibid., xv, p. 407]. In the former disease, however, the effects are less conspicuous, the discoloration of the xylem is less intense and the tylosis less marked, while the discolorations may disappear. In the south of Italy the elm disease caused by *C. ulmi* is mainly slow and chronic, whereas in the north it is exceedingly rapid.

Tracheoverticilliosis was found on *Robinia pseud-acacia* [ibid., xii, p. 665] in 1933 in three localities causing an almost black discoloration of the xylem. It was slowly fatal to *Cercis siliquastrum* growing at Bologna where it also affected *Sophora japonica*, on which it progressed very slowly, the affected wood being nearly black. Two large *Ailanthus glandulosa* trees at Loano, Liguria, were also infected [cf. ibid., xv, p. 183].

The author again refers all strains of *Verticillium*, including the recently recorded *V. amaranthi* [ibid., xiv, p. 765], to *V. albo-atrum* [ibid., xiv, p. 265].

THOMPSON (J. R.). **Cylindrosporium concentricum Grev.**—*Trans. Brit. mycol. Soc.*, xx, 2, pp. 123–132, 8 figs., 1936.

A fungus forming white spots on cabbage leaves in gardens in the Edinburgh district was found upon comparison with the type specimen of Greville's *Cylindrosporium concentricum* to be identical with the latter. Inquiries showed the fungus to be fairly widely distributed though nowhere abundant in England and Scotland, cauliflowers and broccoli also being affected. Only the outer leaves are attacked and the fungus has no serious effect on the host.

The individual spots are minute, less than 1 mm. in diameter, but they are grouped in concentric circles, each group measuring 1 to 2 cm. in diameter. As new spots form on the outside of the group those in the centre disappear and the leaf turns yellow then black, until finally only a number of concentric black lines remains. From the spot is exuded a gelatinous mass of cylindrical, sometimes curved spores with rounded ends (not truncate as described by Greville), measuring 8·5 to 15 by 2·5 to 5·5 (average 11 by 4) μ. Sections through fructifications showed them to be formed beneath the cuticle.

In culture the fungus grew very slowly, the submerged mycelium being greyish in colour and the superficial white and cottony. Later white, gelatinous pustules appeared, resembling the spots on cabbage and like them consisting of masses of spores. The spores were budded off irregularly from the hyphae, there being no specialized sporophores,

and were produced laterally or terminally in succession, lying loosely in irregular chains. At a late stage small, black, sclerotium-like spherical or lobed bodies without any definite internal structure were sometimes produced. In its final form, black, radiating lines appeared in the growth, giving it a dark appearance, though the periphery remained grey.

The author considers that the fungus is not a typical *Gloeosporium*, to which genus it was transferred by Berkeley and Broome, and points out that though, as von Höhnel thought, its habit, the whiteness of the fructifications, and the probable arrangement of the spores in chains (which von Höhnel suspected from the 'truncate' spores) are in themselves insufficient to distinguish it from *Gloeosporium*, when these characters are combined with the subcuticular acervulus, the formation of spores by irregular budding, and the confirmation of the catenulate arrangement of the spores, there seems good reason for retaining the genus *Cylindrosporium* Grev.

Fedorintschik (N. S.). К вопросу определения вредоносности килы Капусты (**Plasmodiophora brassicae**) и выявления сортовой устойчивости Капусты. [Investigations on the determination of the injuriousness of Cabbage club root (*Plasmodiophora brassicae*) and of varietal resistance in the Cabbage.]—*Pl. Prot. Leningrad, 1935*, 2, pp. 87–95, 2 graphs, 1935. [English summary. Received May, 1936.]

In the small scale experiments briefly described in this paper (which were carried out in 1934 in the Leningrad vicinity on soil heavily infected with *Plasmodiophora brassicae*) [*R.A.M.*, xiv, pp. 148, 277; xv, p. 335], the degree of infection of individual plants belonging to 15 varieties of cabbage by club root was designated by numbers: 1, indicating the attack of isolated lateral rootlets; 2, up to 50 per cent. infection of the lateral roots; 3, infection of the main root and the same amount of infection of the lateral roots as in 2; and 4, over 50 per cent. infection of the whole root system. The results were analysed statistically, and indicated that type 4 infection reduced the weight of the affected cabbages to about 50 per cent. of that of healthy cabbages, type 3 by about 10 per cent., while types 1 and 2 either gave no reduction or even resulted in a slightly greater weight of the infected plants. After successful establishment of club root, the progress of the organism in the host tissues was apparently the same in all varieties. While no variation in susceptibility to infection was noticed within a given variety, some of the varieties, e.g., Bronka, short-stemmed Amager, Slavianka, and late Moscow, showed a higher degree of resistance to infection than the others, Braunschweig Gribovka, Braunschweig Hos-Hos, White Russian, and No. 1 being the most susceptible ones.

Jamalainen (E. A.). **Der Einfluss steigender Borsäuremengen auf die Kohlrübenernte.** [The influence of increasing amounts of boric acid on the yield of Swedes.]—*Maataloust. Aikakausk.*, vii, 4, pp. 182–186, 1935. [Finnish summary.]

No adverse effects followed the application to swedes at the Tikkurila Agricultural Experiment Station, Finland, of boric acid at the rate of 5,

10, 15, 25, or 50 kg. per hect., and even at that of 100 kg. the resultant shrivelling of the foliage was only of brief duration. In the absence of brown heart [*R.A.M.*, xv, p. 416] the influence of the treatments on this disease could not be determined, but in two previous field tests its incidence was reduced from 81·1 and 70·4 per cent. to 1 and 2·3 per cent., respectively, without damage to the leaves or yield by boric acid at the rate of 8 kg. per hect. These results were somewhat contrary to expectation, inasmuch as in laboratory trials the presence of minute quantities of boric acid in the culture vessels sufficed to inhibit growth.

MEYER-BAHLBURG [W.]. **Vorausbestimmung des Zuckerrüben-Befalls durch Herz- und Trockenfäule.** [Prediction of Sugar Beet infection by heart and dry rot.]—*Dtsch. landw. Pr.*, lxiii, 6, p. 67, 1936.

There is considered to be no doubt that the borax treatment for the control of heart and dry rot of beets [*R.A.M.*, xv, p. 414 *et seq.*] would soon become a part of the general routine of cultivation if the approximate extent of the damage could be predicted and plans made accordingly. In this connexion some of the factors influencing the development of the trouble are indicated. Meteorological conditions during the summer are of outstanding importance, a severe drought, such as prevailed in 1935, conducing to heavy outbreaks of the disease in soils normally bearing healthy crops. It is often possible to avoid the expensive borax treatment by adjusting the hydrogen-ion concentration of the soil to the requirements of the beet crop by means of judicious modifications in the fertilizing scheme, but where there is actually an excess of lime (to be determined by the electrometric method) the application of borax at the rate of 15 to 20 kg. per hect. is indispensable. In most cases of true lime excess the soil reaction will be found to lie in the region of P_H 7·2 to 7·7. The soil reaction, however, is not decisive in the development of heart rot, which has been observed in a severe form on a sandy heath soil (P_H 5·7 to 6·2) limed in 1911 with marl; the oat crops on this soil suffer from grey speck [ibid., xv, p. 355].

SCHARRER (K.) & SCHROPP (W.). **Gefäss- und Wasserkulturversuche über die Wirkung des Bors allein und in Kombination mit Jod in Düngemitteln.** [Vessel- and water culture experiments on the action of boron alone and in combination with iodine in fertilizers.]—*Phytopath. Z.*, viii, 6, pp. 525–540, 6 figs., 1935.

A detailed, tabulated account is given of the writers' laboratory experiments to compare the effects of Chile saltpetre known to contain small quantities of boron with synthetic sodium nitrate, with and without the addition of boron and iodine, on the health and yield of beets [cf. *R.A.M.*, xiii, p. 796, and preceding abstract]. It was apparent from the results of the tests that boron was of outstanding importance in the prevention of heart and dry rot and increase of yield in fodder beets. Sodium nitrate and iodine without boron failed to counteract the tendency to this disease in the slightly acid clay soils of Weihenstephan, and Chile saltpetre gave comparable results with those of sodium nitrate plus boron in various experiments. Fodder beets were found to require more boron than the sugar-producing varieties, in which the occurrence of heart and dry rot was less frequent and intensive.

Nitsche (G.), Klee (H.), & Mayer (K.). **Befallsstärke und Ergebnisse der Bekämpfung der Rübenwanze im schlesischen Seuchengebiet 1935. II.** [Incidence of the Beet bug and results of the control campaign in the infested area of Silesia in 1935. II.]—*NachrBl. dtsch. PflSchDienst*, xvi, 2, pp. 15–16, 1 map, 1936.

The incidence of the beet leaf bug [*Zosmenus quadratus*] in the infested area of Silesia in 1935 was estimated by counts in at least 20 beet plantings in each of 20 administrative districts of the number of plants affected by crinkle [in the transmission of which the insect is implicated: *R.A.M.*, xiv, p. 548]. From the resultant data the average infestation was found to range from 1 to 35 per cent., the lower figures corresponding either to the newly affected border regions or to those in which systematic control measures had been practised. In Guhrau, for instance, where infection was extremely severe even a few years ago, the regular use of traps has reduced the incidence of infestation to 3 per cent. and adequate yields have been secured.

Young (P. A.). **Sclerotinia rot of Squash and Pumpkin.**—*Phytopathology*, xxvi, 2, pp. 184–190, 2 figs., 1936.

The following are reported as new hosts of *Sclerotinia sclerotiorum* in Montana in addition to squash and pumpkin, a preliminary notice of the disease on which has already appeared [*R.A.M.*, xiv, p. 420]: beans (*Phaseolus vulgaris*), peas, carrot, celery, lettuce, potato, Shasta daisy (*Chrysanthemum maximum*), *Zinnia elegans*, and white and yellow sweet clovers (*Melilotus alba* and *M. officinalis*).

Müller (K.). **Die biologischen Grundlagen für die Peronosporabekämpfung nach der Inkubationskalender-Methode.** [The biological foundations for *Peronospora* control by the incubation calendar method.]—*Z. PflKrankh.*, xlvi, 2, pp. 104–108, 1936.

This is a condensed account of the writer's biological studies (with H. Sleumer) on *Peronospora* of the vine [*Plasmopara viticola*] in relation to its control as indicated by the incubation calendar, a notice of which was given from the original source [*R.A.M.*, xiii, p. 678].

Jenkins (Anna E.) & Giltner (L. T.). **Inoculation of rabbits with Elsinoe ampelina.**—*Phytopathology*, xxvi, 2, pp. 191–194, 1 fig., 1936.

Attention has already been drawn [*R.A.M.*, xv, p. 362] to the negative results of inoculation experiments on rabbits with *Elsinoe ampelina*, the agent of vine anthracnose, details of which are here presented. The positive results reported by Charrin and Le Play (*Rev. Vitic.*, xxiv, pp. 521–523, 1905) are thought to be due to impure or misidentified cultures.

Teterevnikova-Babayan (Mme D. N.). Устойчивость армянских сортов Виноградной лозы против оидиума. [Resistance of Armenian varieties of the Vine to *Oidium*.]—*Pl. Prot. Leningrad, 1935*, 2, pp. 97–103, 1935. [English summary. Received May, 1936.]

The author states that she availed herself of the fairly heavy develop-

ment in 1930 of vine *Oidium* [*Uncinula necator*] in Armenia to obtain records of the reaction of local varieties of the vine towards the disease. The results [which are tabulated] indicated that thick-skinned and highly pigmented grapes are much more resistant to infection than the thin-skinned and light-coloured varieties, and that dense, closely packed bunches suffer more from the disease than the looser ones. The local wine varieties Malai, Black Kakhet, Black Khardji, and the table varieties Lalibedan, Kishmish, and Shir-Shira showed marked resistance to attack by *U. necator* both of the fruit and foliage.

GRANJON (J.). **Les soufres noirs.** [Black sulphur dusts.]—*Rev. Vitic., Paris*, lxxxiii, 2162, pp. 361–367, 1935.

In a prefatory editorial note it is stated that of recent years the use of 'soufre noir' [black sulphur] for the control of *Oidium* [*Uncinula necator*] of the vine has been rapidly gaining ground in southern France and in Algeria owing to its efficacy against the disease and to its considerably lesser cost than the ordinary sulphur dusts. The product is prepared by trituration, after drying and extraction of cyanogen compounds, of the exhausted substances used in the purification of lighting gas. The physical and chemical properties of the product now marketed by different firms are very variable, but all the brands in principle contain free sulphur, sulphocyanides, ferrocyanides, ammonium salts (especially ammonium sulphate), traces of coal tar, and more or less complex organic bases, such as naphthalene and pyridine, mixed with an inert carrier, such as iron oxide, iron sulphate, or calcium carbonate. Of all these constituents the sulphocyanides alone have been experimentally shown to be deleterious to the vine, especially ammonium sulphocyanide, the content of which in the dust should not be higher than 0·35 to 0·4 per cent. by weight. Ferrocyanides, on the other hand, are innocuous to the vine, but their content should be less than 2 per cent., since at higher doses these products tend in free air to react with sulphur, producing noxious sulphocyanides. The free sulphur content of the various brands now on sale varies from 30 to 50 per cent., the most popular in use containing over 40 per cent.

The paper terminates with a brief account of a rapid method to determine the content of the product in sulpho- and ferrocyanides. In the editorial note it is also stated that the black sulphur should be mixed with 30 to 40 per cent. of impalpably ground spent lime, and that the applications of the mixture on the vine should be very light.

England and Wales: new and interesting phytopathological records for the year 1935.—*Int. Bull. Pl. Prot.*, x, 3, pp. 49–50, 1936.

According to a communication from the Ministry of Agriculture and Fisheries, the following fungi (in addition to four recorded from other sources) were observed in 1935 on hosts new for England and Wales: *Penicillium gladioli* [see above, p. 468] on *Montbretia*, *Oidium* sp. on sugar beet, *Phytophthora parasitica* on *Gloxinia*, *Rosellinia necatrix* on *Cyclamen neapolitanum* and *Viola odorata*, *Sclerotinia trifoliorum* [*R.A.M.*, xv, p. 299] on vetches, and *Armillaria mellea* on hops, *Andromeda* sp., and *Ceanothus* sp.

Plagas del campo. Memoria del Servicio Fitopatológico Agrícola. Año 1934. [Field pests. Report of the Phytopathological Agricultural Service for the year 1934.]—Issued by Min. Agric., Dirécc. gen. Agric., Secc. 3a, 348 pp., 1935.

This report, compiled on the same lines as that for 1933 [*R.A.M.*, xiv, p. 424], comprises accounts of the work of the agricultural sections of the provinces and the national service of phytopathological inspection, together with summaries of the investigations pursued at nine phytopathological stations in various parts of Spain. An appendix is added containing the legislative measures promulgated in the country during the year and forms of certification for the export and import of various plants.

Jahresbericht der Versuchs- und Forschungsanstalt für Wein-, Obst- und Gartenbau in Geisenheim am Rhein. [Annual Report of the Viticultural, Fruit Growing, and Horticultural College at Geisenheim-am-Rhein.]—*Landw. Jb.*, lxxxii, 4, pp. 667–696, 1936.

The following items of phytopathological interest, besides those noticed from other sources, occur in this report covering the financial year 1934 [cf. *R.A.M.*, xiv, p. 79]. There is reason to suspect that the 'reisig' disease of vines [ibid., xiii, p. 422] in the Ahr valley is associated with the comparatively low local nocturnal temperatures, which give rise to metabolic disturbances and accumulation of starch. Noll (in an unpublished report to the Minister of Agriculture) states that all the organs of diseased vines are heavily charged with sugar and starch. Observations by K. Kroemer and H. Moog shows that Petri's intracellular cordons [ibid., xi, p. 21] occur in apparently sound and fertile 70-year-old stocks.

A study has been made of the physiology, morphology, and taxonomy of *Rhacodium cellare* [ibid., iv, p. 396], which grows with extreme luxuriance on cellar walls and all sorts of surfaces harbouring dust or the smallest trace of organic material. As a result of cultural investigations the conclusion was reached that the fungus belongs to the genus *Cladosporium* and should be known as *C. cellare*. Chitinous substances afford a particularly favourable substratum for the fungus, the hyphae of which contain chitinase among numerous other enzymes.

The following preparations (tested by the wood block method against *Coniophora cerebella* [*C. puteana*]) were found to be suitable for use as timber preservatives in horticultural and viticultural concerns: totix-normal, totix-wetterfest [weather-resisting], hydrasil, antorgan, and zyman.

The incidence of die-back of elms caused by *Graphium* [*Ceratostomella*] *ulmi* appears to depend, not only on varietal susceptibility to the disease [ibid., xv, p. 183], but also on external conditions, especially drought.

Jahresbericht der Preussischen landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe), Berichtsjahr 1. April 1934 bis 31. März 1935. [Annual Report of the Prussian Agricultural and Research Stations at Landsberg (Warthe) for the administrative year from 1st April, 1934 to 31st March, 1935.]—*Landw. Jb.*, lxxxii, 4, pp. 477–511, 1936.

The following items are taken from the section in this report (pp. 486–

495) dealing with the work of G. O. Appel and his collaborators at the Landsberg Phytopathological Institute [cf. *R.A.M.*, xiv, p. 78]. The fluorometric method of diagnosing potato degeneration (based on the response of the living tissue to certain fluorescent solutions) is stated to have given promising results in preliminary tests on 15,640 tubers of the Ackersegen, Erdgold, Parnassia, Preussen, and Weltwunder varieties.

The tomato varieties showing resistance to leaf mould (*Cladosporium fulvum*) [loc. cit. and below, pp. 481, 522] for two years succumbed to the disease in the third, and the prospects of breeding for immunity from this destructive malady are not considered to be very hopeful [but see above, p. 470]. On the other hand, a new organic fungicide is stated to have given excellent control of the fungus.

In greenhouse and field experiments on one-year-old wild apple seedlings under controlled conditions, the first symptoms of apple scab (*Venturia inaequalis*) infection were observed between 14th and 18th May, the result of an attack on 26th April, when the weather was rainy and the trees were beginning to blossom, so that the ejection of the ascospores was facilitated [ibid., xv, p. 375]. The hot, dry summer prevented the further spread of the disease, but from August to the end of October fresh infections occurred sporadically on wet days, showing the necessity of late sprays to avoid losses in storage [ibid., xiv, p. 111; xv, p. 302]. In inoculation experiments with monospore cultures on grafted trees it was found essential to maintain a temperature below 25° C. (preferably between 15° and 20°) and to keep the leaves sufficiently damp for the spores to germinate and penetrate the tissues. The following conidial diameters were attained by strain A124 at different temperature ranges: 13° to 23°, 16·02 by 7·24 μ; 11° to 23°, 16·32 by 7·06 μ; 11° to 20°, 16·83 by 7·24 μ; and 9° to 18°, 17·78 by 7·73 μ. Of 38 monospore strains of *V. inaequalis* [ibid., xiv, p. 316] isolated from a single lesion on one of the experimental seedlings, 36 were found to be identical in morphological, physiological, and other features, one was markedly different (especially at 28°, at which temperature it made good growth and sporulated while most of the strains failed to develop at all), and another could not be definitely classified. [A paper by K. Küthe embodying these researches appears in *Gartenbauwiss.*, ix, pp. 405–420, 1936.]

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B.C. Dep. Agric. 1935*, pp. AA29–AA38, 1936.

Some reduction in the rotting of cherries (chiefly due to *Sclerotinia cinerea* [*S. laxa*] and to a lesser extent to *Botrytis*, *Penicillium*, and *Rhizopus*) after picking in British Columbia [*R.A.M.*, xiv, p. 495] was effected by spraying with lime-sulphur, but on the whole the economic advantage derived was inconsiderable. In one experiment the treatment temporarily improved the keeping quality of the fruit by reducing the incidence of the three last-named fungi, *S. laxa* being absent. A foliar mottling of cherries, first observed at Nelson in 1932 [ibid., xiv, p. 494; cf. ibid., xv, p. 345] has been shown by [H. R.] McLarty to be of virus origin and readily transmissible to healthy trees by budding or grafting. The disease, which affects the three chief commercial

varieties, Bing, Lambert, and Royal Anne, also causes distortion and stunting of the leaves and insipidity or bitterness of the fruit. A few cases have been detected in the Kootenay Lake commercial orchards.

The results of experiments in the control of *Neofabraea malicorticis* [ibid., xv, p. 74] on apples indicated that Bordeaux mixture is slightly more effective than bouisol (4·5 pints in 100 galls. water) [ibid., xiv, p. 718], whereas the latter at this strength is superior to Burgundy and may be used as a spray prior to picking.

Studies by W. R. Foster and two collaborators on the reaction of a number of wheat varieties to *Tilletia levis* and *T. tritici* [*T. foetens* and *T. caries*] showed that Red Winter, Turkey Red Winter, Oro, Ridit, Albit, Jenkins × Ridit, Hussar, and White Odessa are practically immune [ibid., xv, p. 344], Yaroslav highly resistant, and Kanred Minhardi, Svea, Turkey × Minessa, and Kanred × Bel. Buffum moderately so. The incidence of infection was found to be most severe at a temperature of 45° to 50° F., and it is thought that a considerable reduction would follow early (August) or late (last week or so of October) sowing.

The F_1 progeny of a cross between Cornell F_5 tomato, which is resistant to leaf mould (*Cladosporium fulvum*) [see preceding abstract], and the susceptible Kondine were very resistant, showing the factor for resistance to be dominant. The disease was almost completely controlled by weekly applications of vaporized sulphur by means of the sulphur nebulator. *Uromyces betae* [ibid., xv, p. 191] was recorded on seed beets for the first time and *Plenodomus meliloti* [ibid., xv, pp. 27, 445] on lucerne.

Ninth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1935.—108 pp., 1935. [Received April, 1936.]

In the section of this report dealing with plant investigations (pp. 20–28) it is stated that a movement towards the standardization of the nomenclature of apple storage diseases has been started in Australia in co-operation with the New Zealand Department of Scientific and Industrial Research. Corky pit in New Zealand is identical with internal cork [*R.A.M.*, xv, p. 446] in Australia. Common tree pit or cork on Cleopatra and Sturmer apples in Tasmania is not identical with blotchy core [ibid., xiv, p. 520] in Western Australia, the former being associated with undesirable soils, and the latter with atmospheric dryness.

All wheat varieties tested were equally susceptible to flag smut [*Urocystis tritici*: ibid., xiv, pp. 89, 425] when germinated under normal seasonal soil temperature and moisture conditions. Temperature variations after germination appeared to be the chief factor affecting the amount of damage. Infected plants had a reduced root system.

Of several hundred two-year-old pine seedlings grown from seed from trees affected with needle-fusion [loc. cit.] only one became affected.

In the section dealing with cold storage (pp. 59–69) it is stated that the banana black end fungus (*Gloeosporium musarum*) [ibid., xv, p. 281] is almost invariably found on dead and dying leaves and bracts, few spores being present in the air. Infection of the cut ends mostly occurs

from the outer surface when the bunches are divided into 'singles', and slow ripening under humid conditions conduces to infection. During the summer high temperatures and possibly a soft-natured fruit are factors determining infection.

In stored Jonathan apples scald usually appears in June and July when the fruit is at its climacteric [ibid., xv, p. 161] and does not increase in incidence subsequently. One of the chief sources of wastage in Granny Smith apples is superficial scald, generally controllable by waxed wrappers or delayed storage [ibid., xv, p. 299]. Storage wastage in grapes [ibid., xiv, p. 491] is mainly due to dehiscence (a disorder of senescence) and mould [unspecified], the latter being largely controllable by careful handling.

Uppal (B. N.) **Appendix K. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1934–35.**—*Rep. Dep. Agric. Bombay, 1934–35*, pp. 175–182, 1936.

The following items, besides those noticed from other sources, occur in this report. The resistance to *Fusarium* [*vasinfectum*] of the D–IX strain of sann hemp [*Crotalaria juncea*: *R.A.M.*, xiv, p. 560; xv, p. 278], already maintained since 1931, is considered to be fully established by the results of soil temperature tank experiments at 28° C. The optimum temperature for the development of the disease was found to lie between 25° and 30°, and infection is most virulent with a soil-moisture content of 10 to 30 per cent. Cross-inoculation tests showed *C. anagyroides* and *C. striata* to be readily attacked by the fungus, while *Cajanus indicus* [*C. cajan*], soy-bean, and *Crotalaria usaramoensis* are apparently immune.

Phytophthora palmivora has been ascertained to be the agent of citrus gummosis and brown rot in Bombay, this being the first record of such symptoms due to the species in question. The jamburi horticultural variety of lemon has shown virtual immunity from infection, but the mosami orange and the pomelo are very susceptible, while an intermediate position is occupied by the common mandarin.

The fungus responsible for powdery mildew of mango [ibid., vii, p. 654; x, p. 326] is thought to be probably *Erysiphe polygoni* on account of its lobate haustoria.

Macrophomina phaseoli [ibid., xiv, p. 560; xv, p. 426], either alone or in conjunction with *F. vasinfectum*, has been isolated from hundreds of samples of Bombay cotton affected by root rot. The plants were found to contract infection readily at soil temperatures from 30° to 34°, but the manifestation of external symptoms seemed to depend largely on air temperatures.

Wolfe (H.). **Report of the Deputy Director (Plant Industry).**—*Rep. Dep. Agric. Kenya, 1934*, i, pp. 37–70, 1936.

The following references to work of pathological interest are made in this report. Attempts at the control of the coffee berry disease [*Glomerella cingulata*: *R.A.M.*, xiii, pp. 217, 764] by palliative measures give little hope of success and the most promising line of attack is to graft selected resistant (Blue Mountain) scions on susceptible stocks in

plantations of the French Mission type, though it is not yet known whether resistance will be preserved under these conditions. A considerable decline in the incidence of take-all of wheat [*Ophiobolus graminis*: ibid., xiv, p. 427] followed the adoption by farmers of appropriate cultural measures, but crop rotation (biennial or longer) will probably be necessary to eradicate the fungus in severe cases.

The new wheat variety N.B. 230 has been of great utility at high elevations where resistance to yellow rust (*Puccinia glumarum*) and to form K. 2 of stem [black] rust (*P. graminis*) [loc. cit.] is a primary consideration. Very promising results were further obtained with the cross 112, which is resistant to *P. glumarum*, extremely so to three forms of *P. graminis*, and withstands infection by K. 2 moderately well at high altitudes. Strains from crosses 130 and 131 are resistant both to yellow rust and to all four forms of black rust, while certain selections from 117 and 122 are equally resistant to *P. graminis* with 112, but only on a level with Kenya Governor in respect of resistance to *P. glumarum*. For the medium and lower elevations cross 58 is likely to prove very satisfactory, being resistant to all four forms of *P. graminis* and sufficiently so to *P. glumarum* to be cultivated up to about 7,000 ft. In a test at the Dominion Rust Research Laboratory, Winnipeg, the incidence of rust infection on the Kabete wheats (progeny of crosses between Kenya Standard and Kabete hybrids) was 10 per cent. and nil on crosses 112, 122, 131, and 58, compared with 65 per cent. on susceptible Canadian varieties.

Summary report of progress, 1935.—*Bull. Me agric. Exp. Sta.* 380, pp. 139–258, 13 figs., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 495]. In spraying experiments against potato late blight [*Phytophthora infestans*] at the Aroostook Farm, no serious injury resulted from applications of Bordeaux mixture in bright sunlight or at high temperatures [cf. ibid., xiv, p. 708].

In an experiment by D. Folsom tuber-line Green Mountain potato seed produced under a cloth cage in 1933 was planted by the tuber-unit method [ibid., xiv, p. 714] in 1934 in two isolated fields. Records available from 42 acres planted from the resulting crop give about three mosaic hills, eight leaf roll, and three yellow top [ibid., xv, p. 460] per acre, a total of approximately 0·1 per cent. G. W. Simpson also found that isolated tuber-unit seed plots continue to give practical control of virus diseases of potato. Field experiments under controlled conditions in 1934 showed that some 800 aphids (*Myzus persicae* and *Aphis abbreviata*) per plant were necessary to effect mosaic transmission; in greenhouse tests with *M. persicae* and *M. circumflexus* the disease was transmitted only when over 100 aphids per plant were used. Leaf roll was much more readily conveyed from diseased to healthy plants, several instances of its transmission by a single individual of each species being on record.

Blackleg [*Bacillus phytophthorus*] was found by R. Bonde to be largely responsible for seed-piece decay in Aroostook County [ibid., xiii, p. 534], where up to 12 per cent. of infection by this disease was observed in 80 per cent. of the Irish Cobbler and 65 per cent. of Green

Mountain fields examined, the average incidence on the former variety being 1·85 and on the latter 1·17 per cent.

In experiments by W. P. Raleigh and R. Bonde three minutes' immersion in acidulated mercuric chloride gave good control of *Rhizoctonia* [*Corticium solani*: ibid., xv, p. 46] but may injure the tubers unless they are thoroughly dried before storage. Slightly less satisfactory results were given by treatment with organic mercury dips. Seed tubers free from the fungus did not contract infection when planted in the field, suggesting that black scurf is largely attributable to the use of diseased stock. R. Bonde found that immature Green Mountain tubers harvested after heavy rains following a long drought before the foliage was dead were extensively cracked [see below, p. 525], the condition mostly involving the turgid tissues exposed to injury in digging and handling.

In 1935 forty 22-year-old McIntosh apple trees were used for a comparison of full- and half-strength lime-sulphur. The yield of fruit per tree treated by the latter (½ gall. liquid or 2 lb. dry lime-sulphur to 50 galls. mixture) was 8·4 bush., compared with 6·5 bush. from those treated by the former, an unexpected result in view of the yields of the preceding five years, averaging 3 and 4 bush., respectively. In this moderately severe scab [*Venturia inaequalis*] season the efficacy of the lime-sulphur spray was practically equalled by that of the wettable flotation sulphur [see below, p. 514] and bentonite sulphur dust [ibid., xiv, p. 151].

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1935 (Bull.* 327), pp. 23–28, 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 683]. In two field trials by C. J. Gilgut on the comparative efficacy of various dry chemical seed treatments, red copper oxide [ibid., xv, p. 282] gave the best stand of lettuce, closely followed by zinc oxide [ibid., xiv, p. 382], the latter being superior for cabbage, radish, carrot, and cucumber. Vasco, a commercial product containing zinc oxide, gave slightly better results in the case of turnips and spinach. Semesan proved to be the most efficacious stimulant for peas, beets (which responded, however, almost equally well to red copper oxide), maize, and onions.

The severity of damping-off among herbaceous plants [ibid., xiv, p. 684] was reduced in W. L. Doran's tests by the application of antimony and potassium tartrate (8 gm. per sq. ft.) to naturally infested soils but not to those heavily inoculated with *Pythium de Baryanum*. Hollyhocks appear to be very tolerant of copper, responding favourably to 20 gm. copper-lime dust and 9 gm. metallic copper, both of which largely prevented damping-off.

C. J. Gilgut found that six applications of flotation sulphur, linco colloidal sulphur [ibid., xv, p. 160], liquid lime-sulphur, and a combination of liquid lime-sulphur, calcium arsenate, and aluminium sulphate gave, respectively, 88, 92, 96, and 95 per cent. control of *Gymnosporangium juniperi-virginianae* [ibid., xv, pp. 232, 303] on Wealthy apple leaves.

A survey of Massachusetts for the presence of Dutch elm disease

(*Ceratostomella ulmi*) under the supervision of A. V. Osmun and M. A. McKenzie gave negative results in respect of this disorder, but led to valuable observations on the very similar troubles caused by *Cephalosporium* [ibid., xiv, p. 406] and *Fusarium* spp. and *Verticillium dahliae* [ibid., x, p. 696].

In tests carried out by H. F. Bergman and W. E. Truran (p. 34 of the report) two applications of 5–3–50 Bordeaux mixture were more effective against rots of cranberries [ibid., xii, p. 231] than two applications of two mercurial sprays, or 25–75 monohydrated copper sulphate and hydrated lime. The Bordeaux treatment was the most effective in controlling rots in storage.

Agricultural research in New Hampshire.—*Rep. N.H. agric. Exp. Sta., 1934*, 31 pp., 1935. [Received June, 1936.]

The following items of phytopathological interest occur in this report. O. Butler's studies on the factors governing lime-sulphur damage on apple leaves indicated that the application of the sprays during very hot weather (30° to 40° C. in the shade) is not so injurious as generally believed [see above, p. 484].

E. J. Rasmussen found that by 17th July brown core had developed in 43 per cent. of the apples from a sod plot receiving 10 lb. sodium nitrate per tree, in 63 per cent. of those from a cultivated plot to which 5 lb. sodium nitrate per tree was applied, and in 80 per cent. of those of a sod plot given a complete fertilizer including 10 lb. sodium nitrate per tree. A slight delay in the storage of McIntosh apples considerably reduced susceptibility to brown core without appreciably increasing breakdown or curtailing the storage life. Cortland apples picked about the time of McIntosh harvest were found on removal from storage to be very subject to scald [ibid., xv, p. 300 and above, p. 482], even when wrapped in oil paper, whereas fruit picked three weeks later remained free from this trouble and developed no internal breakdown until 17th July.

Two cover sprays were found by O. Butler and S. Dunn to be essential for the protection of McIntosh apples from scab [*Venturia inaequalis*], whereas one suffices in the case of the less susceptible Baldwin. In this year's experiments with cal-mo-sul [ibid., xiii, pp. 310, 358] 1 in 50, followed by flotation sulphur from the calyx application onwards, satisfactory control was obtained, but under conditions of heavy infestation the former has given very disappointing results. The data so far secured indicate that, under New Hampshire conditions, the ascospores ripen during the last ten days of April and are ejected in the course of the next wetting rain, irrespective of the length of the snow cover or mean temperature of the preceding winter.

In O. Butler's experiments mosaic potatoes grown at a mean temperature of 20° outyielded those cultivated at 15°. The earliest appearance of mosaic symptoms ranged from 2 to 12 days after emergence. To date no tendency to run out has been exhibited by mosaic plants grown at either temperature continuously or alternately. Leaf roll plants, on the other hand, show a marked falling-off in productivity when grown continuously or alternatively at both temperatures, and more especially when removed from the higher to the lower. Seed-piece decay in leaf roll plants at 15° and 20° amounted to 7·7 and 50 per cent., respectively.

K. W. Woodward's observations on timber preservation from 1929 to 1934 showed 75 per cent. decay in untreated white pine fence posts and 11 per cent. in those given the brush treatment [ibid., xii, p. 1], while open-tank and pressure creosoting and the zinc m[eta] arsenic method [ibid., xiv, p. 667] gave complete control of rotting.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1934–35*, pp. 67–89, 3 figs., 1935. [Received May, 1936.]

In further work by J. J. Wilson at Iowa in 1934 on the production of watermelon varieties resistant to wilt [*Fusarium bulbigenum* var. *niveum*: *R.A.M.*, xiv, p. 220; xv, p. 276, and below, p. 553], sufficient seed of two resistant varieties 'Iowa Dixie' and 'Improved Pride of Muscatine' was produced to plant 8 and 6 acres, respectively, in 1935; the latter is a new segregate unrelated to the former K–S4 (Pride of Muscatine) and isolated from Kleckley Sweet.

Experiments by H. C. Murphy showed that winter oat varieties and selections infected with crown and stem rust [*Puccinia lolii* and *P. graminis*, respectively: ibid., xiv, p. 220, and below, p. 492] were more susceptible to injury from artificially produced low temperatures than similarly hardened rust-free plants; it was invariably possible to select an exposure fatal to all infected plants of a particular variety or selection which would yet allow the complete survival of rust-free plants. The heavier the infection the greater was the susceptibility to injury. Shading before freezing reduced resistance to freezing injury in much the same way as did rust infection.

In studies by C. S. Reddy, made to find a potato seed-piece treatment effective against scab [*Actinomyces scabies*] and black scurf [*Corticium solani*], acidulated mercuric chloride, new improved semesan bel, A dust, and C dip gave, respectively, marketable increases in yield of 2·2, 17·2, 17·5, and 19·1 per cent.

W. J. Henderson found that the best control of sugar beet leaf spot [*Cercospora beticola*: ibid., xv, p. 337] was obtained in plots with a spacing of 28 by 28 in. Tests by C. S. Reddy again demonstrated that 5 per cent. ethyl mercuric phosphate at the rates of ¼ and ½ lb. per 100 lb. sugar beet seed effectively inhibited damping-off. In 11 sugar beet fields areas with acid soil again had poorer stands than areas with neutral soil. On acid soil the principal cause of damping-off was *Pythium de Baryanum* [loc. cit.], the seed-borne *Phoma betae* [ibid., xv, p. 415, and below, p. 550] playing a minor part; the role of *Rhizoctonia* sp. is probably not appreciable in the field.

G. L. McNew reports that severe losses were sustained in nurseries owing to bulb rot of *Lilium auratum* caused by *Rhizopus necans* [ibid., x, pp. 668, 777].

Investigations by I. E. Melhus and W. J. Henderson showed that some lines of Red Globe onions possess 60 to 70 per cent. tolerance to pink root [*Phoma terrestris*: ibid., xiii, p. 558; xiv, p. 150]. A selection of the Yellow Globe variety made in 1931, open-pollinated and mass-selected, shows promise of resistance. A selected strain of the Riverside Sweet Spanish onion variety is highly resistant to yellow dwarf [ibid., xiv, p. 810].

G. L. McNew found that cedar-apple rust (*Gymnosporangium juni-*

peri-virginianae) [see above, p. 484] from some parts of Iowa did not infect the leaves of Turley apples, whereas cultures from other localities produced the usual chlorotic spot on this variety, on which also two cultures gave a spreading type of chlorosis followed by necrosis and defoliation. Apparently five physiological forms may be segregated on the aecidial hosts.

Observations by C. S. Reddy showed that the barley variety most resistant to scab [*Gibberella saubinetii*: ibid., xiv, p. 149] in Iowa is Peatland, followed by Bonami and OAC 21. Immunization studies made by G. N. Davis and R. H. Porter with barley seed infected with *G. saubinetii* showed that germination of such seed may be materially increased by twelve hours' pre-soaking in filtrates from cultures of *G. saubinetii*, *Fusarium moniliforme* [*G. moniliformis*], *Diplodia zeae*, *Aspergillus niger*, and *Helminthosporium gramineum*. Higher percentages of germination resulted when the seeds were treated with the filtrate from a fungus other than the one against which they were being immunized. Disease-free seed so treated was with one exception reduced in viability.

Bitancourt (A. A.), Gonçalves (R. D.), & Carneiro (J. G.). **Relação das doenças e fungos parasitas observados na secçao de phytopathologia durante os annos 1933 e 1934.** [Report on the diseases and parasitic fungi observed in the section of phytopathology during the years 1933 and 1934.]—*Arch. Inst. biol. Def. agric. anim., S. Paulo*, vi, pp. 206–211, 1935. [Received June, 1936.]

Among other items of interest in this summary of the diseases found affecting cultivated plants in San Paulo, Brazil, during 1933 and 1934 [cf. *R.A.M.*, xiii, p. 618] the following may be mentioned. Bananas were attacked by leaf spot (*Leptosphaeria musarum*) [ibid., xii, p. 458], sooty mould (*Chaetothyrina musarum*) on [Giant] Fig fruits, and storage rot due in part to *Stachylidium theobromae* [ibid., xiv, p. 427]. Avocado pears suffered from a fruit rot caused by *Acrostalagmus cinnabarinus*. A species of *Pestalozzia* was isolated from lesions on branches of the same host and induced similar symptoms as a result of inoculation experiments. Beets were affected by curly top [ibid., xi, p. 562; xv, p. 418].

Stempell (W.), Romberg (G. v.), & Ulpts (R.). **Über erfolgreiche Behandlung von Pflanzentumoren mit Organismenstrahlung aussendenden Mückenlarven.** [On the successful treatment of plant tumours with gnat larvae emitting organic radiation.]—*Biol. Zbl.*, lvi, 3–4, pp. 114–116, 1 fig., 1936.

Pelargonium zonale plants inoculated with *Bacterium tumefaciens* [*R.A.M.*, xv, p. 206] were afterwards subjected to irradiation by larvae of *Corethra plumicornis* (enclosed in a celluloid capsule) for periods up to 20 hours, with the result that, during the three months covered by the tests, tumour formation was greatly retarded and in 25 per cent. of the plants completely suppressed. All the inoculated plants not so treated developed well-marked tumours within a month.

WINKELMANN (A.). **Fortlaufend arbeitender Kurznassbeizapparat 'Primator' System Stümpfig der Firma Gustav Drescher, Halle (Saale).** [Continuously working short liquid disinfection apparatus 'Primator' (Stümpfig system) supplied by the firm of Gustav Drescher, Halle (Saale).]—*Tech. in d. Landw.*, xvii, 3, pp. 19–20, 1 fig., 1 diag., 1936.

On the basis of official tests at the Biological Institute, the Primator short disinfection apparatus [cf. *R.A.M.*, xiv, p. 501], supplied by G. Drescher, Halle, was found eminently suitable for the treatment of cereal and other seeds (e.g., flax and beet), the steeping solution being adequately utilized and the construction of the machine technically satisfactory. Its cost is M.390 and its capacity ranges from 300 to 1,200 kg. of seed.

BEVIN (R. H.). **Cereal smuts and their control.**—*Tasm. J. Agric.*, N. S., vii, 1, pp. 25–32, 2 figs., 1936.

The author gives short popular notes on the life-histories and control of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], loose smut (*Ustilago tritici*), and flag smut (*Urocystis tritici*) of wheat [*R.A.M.*, xv, p. 208], the last-named of minor importance in Tasmania, loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]), and loose and covered smuts of barley (*U. nuda* and *U. hordei*).

NICOLAS (G.). **Attaque intense et très précoce de l'Orge à deux rangs par Puccinia glumarum, parasité à son tour par un Darluca.** [An intense and very early attack on two-rowed Barley by *Puccinia glumarum*, parasitized in its turn by a *Darluca*.]—*C.R. Soc. Biol., Paris*, cxxi, 9, pp. 799–801, 1936.

The author records the occurrence in February, 1935, of *Darluca filum* [*R.A.M.*, xv, p. 74] heavily parasitizing the uredosori of *Puccinia glumarum* attacking self-sown two-rowed barley (*Hordeum distichum nutans*) in France.

NEWTON (MARGARET) & JOHNSTON (T.). **Stripe rust, Puccinia glumarum, in Canada.**—*Canad. J. Res.*, xiv, 2, pp. 98–108, 1 fig., 1936.

In Canada *Puccinia glumarum* is confined to British Columbia, Alberta, and the western half of Saskatchewan [*R.A.M.*, xii, p. 83]. The gradual diminution in the prevalence of the fungus in the easterly parts of the prairie provinces is probably associated with climatic conditions, the high day temperatures prevailling doubtless preventing the growth of the fungus during summer. Good germination of the uredospores was only secured between 5° and 18° C., the optimum for germination being 10° to 12° and for rust development 13° to 16°. Greenhouse experiments demonstrated that a temperature of 25° for 10 to 12 hours each day rendered a susceptible host plant resistant, and it is probable that even if the fungus were able to germinate in summer conditions, the high day temperatures common in the prairies in summer would induce resistance in the host plants. The rust becomes prevalent in Alberta only in autumn, spread coinciding with the shortening of the day and the reduction in the day temperature. It is unable to penetrate

very far eastwards before the end of autumn and it is unlikely the rust will ever become thoroughly established in Manitoba and Saskatchewan.

The natural hosts of *P. glumarum* include native grasses, particularly *Hordeum jubatum*, and species of *Agropyron*, *Elymus*, and *Bromus*. When taken from these hosts the rust was found capable of attacking wheat in all cases. Furthermore, forms 4, 6, 8, and 13 are able to attack seedlings of *Hordeum*, *Agropyron*, and *Elymus* and the authors therefore doubt the existence of Eriksson's five specialized varieties of the fungus [ibid., xv, p. 143]. All Canadian collections of the rust were identified as forms 8 or 13, the latter being by far the more common.

HANNA (W. F.). **Effect of vernalization on the incidence of loose smut in Wheat.**—*Sci. Agric.*, xvi, 7, pp. 404–407, 1936. [French summary.]

After a brief reference to the literature dealing with the effect of environmental conditions on the incidence and development of loose smut of wheat [*Ustilago tritici*], the author states that vernalization of Marquis seed-grain, artificially inoculated with the smut, did not appreciably affect the incidence of the disease in tests which were carried out in 1934 at Winnipeg.

BAMBERG (R. H.). **Black chaff disease of Wheat.**—*J. agric. Res.*, lii, 6, pp. 397–417, 1936.

This is a full account of the author's investigations on the black chaff disease of wheat (*Bacterium translucens var. undulosum*), a preliminary report on which has been noticed from another source [*R.A.M.*, xi, p. 434]. In addition to the information already imparted, it is stated that in Minnesota the disease usually does not appear until wheat is headed out and approaching maturity; seedlings are rarely infected. Some varieties are often attacked at the lower nodes of the culms, whereas in others the infection is usually limited to the heads and the necks of the culms. In addition to the hosts previously listed, einkorn wheat has also been found to be susceptible to black chaff. The organism was shown to be resistant to extremely low temperatures, remaining viable in soil cultures placed outdoors for at least 124 days after the middle of December. The existence was established of strains of the bacterium, which differed in their cultural and physiological characters, as well as in pathogenicity. Considerable variations were also noticed in the relative susceptibility of different varieties of wheat to black chaff, field observations over a number of years indicating that Marquis, Mindum, and Kubanka are resistant, and Hope, H–44, and Kota very susceptible.

BLAIR (I. D.). **The foot-rot disease of Wheat.**—*N.Z.J. Agric.*, lii, 3, pp. 129–137, 3 figs., 1936.

Wheat in the Canterbury area of New Zealand is stated to be severely attacked by foot rot, the principal causal organism of which was identified as *Fusarium culmorum* [*R.A.M.*, xv, p. 428]. The disease develops throughout the growing season, the first noticeable symptom being a seedling blight, which commonly accounts for 10 per cent. of the field stands, while the losses in some fields may be as high as 46 per cent. In the early spring the trouble manifests itself in the form of

backward, yellowish, tip-withered plants, which may either be scattered or the whole crop may be affected; the hypocotyl of the diseased plants usually rots away, but adventitious roots may develop above the lesion and allow the plant to survive. Other conditions associated with the disease are whiteheads and wheat scab.

Surveys of over 100 wheat fields indicated that foot rot may develop after any crop included in rotation schemes, and that growing wheat for two or three consecutive years on one area does not appear to increase the percentage infection. Seedling blight was always high in fields heavily infested with *Agropyron repens*, the rhizomes of which were shown to carry pathogenic forms of *Fusarium*. Perennial rye grass [*Lolium perenne*] sown after wheat badly affected with seedling blight showed patches of stunted plants, carrying *Fusarium* on the underground parts. Foot rot appeared to be more serious on heavy wheat land than on lighter soils. In one experiment, in which non-manured rows of Tuscan wheat were intercalated between manured rows, the former were distinctly more affected by seedling blight than the latter. Soil acidity was found to be directly correlated with the severity of seedling blight.

Control should be directed towards affording the wheat plant favourable conditions for its development, among which the preparation of a firm seed-bed and avoiding sowing too late in the season, i.e., in very cold soils, are specially recommended. Top-dressing in the spring tends to minimize the trouble.

Padwick (G. W.). **A growth factor influencing the development of Ophiobolus graminis Sacc.**—*Sci. Agric.*, xvi, 7, pp. 365–372, 1936. [French summary.]

Continued experiments with *Ophiobolus graminis* [*R.A.M.*, xiv, p. 622] showed that the growth of the fungus, which is unable to develop in a number of common synthetic solutions in the absence of certain plant or animal extracts, was greatly activated in a standard synthetic solution by the addition of 7·5, 15, or 30 c.c. per l. of an aqueous extract of carrots, from which the proteins, and the ether- and acetone-soluble fractions had been removed, as well as much of the sugar; this extract provided very little sugar and a small quantity of nitrogen. A growth-stimulating effect was also exerted by casein aqueous extract deprived of its proteins and of its ether-soluble fraction. Further experiments are required to determine whether the growth-promoting factor present in these extracts is identical with the second growth factor found by Buston and his collaborators to be necessary for *Nematospora gossypii* (*Biochem. J.*, xxv, 5, pp. 1656–1673, 1931; xxvii, 6, pp. 1859–1868, 1933). In the experiments a strain of bacteria was found, which also stimulated the growth of *O. graminis* in synthetic solutions. It is believed that the growth factors probably play an important part in maintaining the balance of micro-organisms in field soils.

Padwick (G. W.). **Biologic strains of Ophiobolus graminis Sacc.**—*Ann. appl. Biol.*, xxiii, 1, pp. 45–56, 2 graphs, 1936.

A comparative study of 14 isolates of *Ophiobolus graminis* [see

preceding abstract] obtained from wheat, *Agropyron tenerum*, *A. repens*, and *Hordeum murinum* in England, Canada, and Australia showed that the optimum growth temperature for all of them on carrot dextrose agar was in the neighbourhood of 25° C., though they varied in their ability to grow at temperatures above and below this, some growing at both 12° and 30°, whereas others were inactive at these temperatures, and none grew at 36°. They varied also in type of growth on this medium, chiefly in the production of macrohyphae which were not formed by any strain on plain agar. Saltation was observed, leading to the abundant production of black macrohyphae by a culture (isolated from *A. repens*) normally producing very few. Marked differences were shown in ability to survive desiccation (over calcium chloride or 60 per cent. sulphuric acid), which appeared to be related to the presence of macrohyphae. Studies on differential host reaction, using several isolates and Red Fife, Little Joss, Reward, and Squarehead wheat varieties, Plumage Archer barley, *Triticum monococcum*, *T. dicoccum*, and *T. spelta*, showed that the isolates that caused most injury to any one host caused most injury to the rest, the converse being also true, i.e., hosts most resistant to one isolate were also those most resistant to the rest. None of the varieties used, however, showed any marked degree of resistance. The different isolates varied widely in pathogenicity, but no specificity was exhibited to any of the hosts used.

LEDINGHAM (G. A.). **Rhizophidium graminis n.sp., a parasite of Wheat roots.**—*Canad. J. Res.*,'xiv, 3, pp. 117–121, 1 pl. 1936.

A brief morphological and biological account is given of a hitherto undescribed species of *Rhizophidium* [*R.A.M.*, viii, p. 571] found in 1930 growing on living roots of wheat in Ottawa, Canada, and in 1932 on living roots of a *Panicum* sp. in Boston, Massachusetts, and for which the name *R. graminis* is proposed [with a Latin diagnosis]. This is stated to be the first known record of a member of this genus on higher plants. In Ottawa the infection of the wheat roots was in general light and very scattered, but in certain specimens the parasite was very plentiful. Attempts to isolate the fungus were unsuccessful.

R. graminis is characterized by smooth-walled, globose to ellipsoid, solitary or gregarious zoosporangia, 10 to 75 μ in diameter, producing at their base fine rhizoids which ramify within the host cell. The zoospores are ejected by the sudden bursting of the sporangium, the cup-shaped basal wall of which persists several days. The active zoospores are usually piriform, with one polar cilium 10 to 12 μ in length, and measure on the average 3 by 1·8 μ. The resting spores are globose, with a smooth endospore and a rough exospore wall and oily protoplasmic contents, and are 6 to 12 μ in diameter. Nuclear transfers occur through the rhizoids of two thalli. Germination of the resting spore is effected by the extrusion of the cell contents to form a thin-walled sporangium. Histological studies indicated that in wheat roots infection was initiated by the zoospores attaching themselves to a root hair or an epidermal cell of the root, and each developing directly into a zoosporangium; the rhizoidal system originates as an outgrowth from the zoospore without the formation of a subsporangial vesicle.

JOHNSTON (C. O.). **Reaction of certain varieties and species of the genus Hordeum to leaf rust of Wheat, Puccinia triticina.**—*Phytopathology*, xxvi, 3, pp. 235–245, 1 fig., 1936.

Details are given of the writer's greenhouse experiments, covering a period of six years at Manhattan, Kansas, on the reaction of a number of cultivated varieties and wild species of barley to physiologic forms 1, 2, 5, 9, 10, and 55 of *Puccinia triticina* [*R.A.M.*, xiv, pp. 225, 299; xv, p. 83].

While none of the cultivated forms proved to be completely susceptible to the rust, several were more so than the wheat variety Democrat, e.g., three types of *Hordeum intermedium nutans* (barley wheat) and Black Hull-less (*H. vulgare nudum nigrum*). Jet (*H. jubatum nigrinudum*) was only moderately resistant to form 9 and was slightly susceptible to 10 and 55. Coleobunker (*H. vulgare pallidum*) was very mildly infected by forms 5 and 55. Abyssinia (*H. deficiens medium*) by 5, 9, 10, and 55 and Steinfels (same group) by 1, 5, 9, and 55. Even the most susceptible of these cultivated barleys did not succumb to the disease so completely as the Malakoff and Mediterranean wheat varieties in response to some of the forms, but they did approximate to Hussar in their reactions to 9, 10, and 55, and were more susceptible than any of these wheats to form 1. The copious production of small uredosori on the susceptible cultivated barley varieties, as well as the wild species mentioned below, may possibly assist in the propagation of *P. triticina*. In general, greater differences in reaction to the rust were exhibited when several varieties or strains were inoculated with a single physiologic form than when one was infected by several different physiologic forms.

Among the wild species *H. pusillum* C.I. 2007 (from California) presented the nearest approach to susceptibility in tests with forms 5, 9, and 10, followed by *H. spontaneum*, *H. murinum*, *H. bulbosum* [*ibid.*, xii, p. 274], and an Idaho strain of *H. murinum*.

The majority of the barley varieties and species manifesting susceptibility to *P. triticina* were found to belong to the 14- and 28-chromosome groups—a condition opposed to that observed in wheat, the resistant varieties of which are mostly found among groups with the lower chromosome numbers and the highly susceptible in the *vulgare* group with 42 chromosomes [cf. *ibid.*, xv, p. 830].

MITCHELL (H. C.). **Effect of crown rust on the composition of Oats.**—*Phytopathology*, xxvi, 3, pp. 220–234, 1 fig., 1936.

In this full account of the study in Iowa of crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*: *R.A.M.*, xv, pp. 353, 367, 625] it is stated that infection initiated in the anthesis stage on the susceptible Markton variety and in the seedling, boot, and anthesis stages on the resistant Victoria, did not appreciably influence the amounts of moisture, ash, fat, and fibre in the kernels. There was, however, a slight increase in the crude protein content of infected plants and a corresponding decline in nitrogen-free extract. The green weights of diseased plants of Markton and Ivgold (susceptible) and of Victoria and Bond (nearly immune) was 66·3, 63·6, 29·2, and 14·7 per cent.,

respectively, lower than that of healthy ones. Concentrations of insoluble solids, ash, nitrogen, and acid-hydrolysable substances in the green plant were all increased by rust infection, especially ammonia, amide, and nitrate and nitrite nitrogen. In the susceptible Markton variety the increases in these non-colloidal nitrogen fractions amounted to 257·1, 327·3, and 322 per cent., respectively, compared with a maximum increase of 25·8 per cent. for colloidal or protein nitrogen and of 29·6 and 29·7 per cent., respectively, for insoluble solids and acid-hydrolysable substances. Infection by *P. lolii* caused a decrease in the sucrose, glucose, and levulose contents of 83·6, 78·7, and 97·4 per cent., respectively, in Markton, the corresponding figure for total solids and dextrin being 19·3 and 23·3 per cent., respectively.

HOLTON (C. S.). **Origin and production of morphologic and pathogenic strains of the Oat smut fungi by mutation and hybridization.**—*J. agric. Res.*, lii, 4, pp. 311–317, 1 diag., 1936.

A brief account is given of the author's continued studies on the oat smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*) [*R.A.M.*, xii, p. 633 *et passim*], in which he claims to have established that the new buff type of oat smut [loc. cit.] is the result of mutation in *U. kolleri*, which it resembles except that its chlamydospores are hyaline instead of brown. Evidence is presented, indicating that the change in the colour factor occurred during meiosis in a germinating chlamydospore, one of the four haploid nuclei losing the factor for brownness. It is suggested that the factors for sex and chlamydospore colour segregate independently of each other. In hybridization experiments, a new pathogenic strain of *U. kolleri* was obtained by crossing a Gothland strain of *U. avenae* with a Monarch strain of *U. kolleri*, which in the F_3 generation proved to be almost as virulent on Gothland as the *U. avenae* parent, but somewhat less so on Monarch than the *U. kolleri* parent. Crossing a buff smut strain from Monarch wheat with the Gothland strain of *U. avenae* also gave a new strain of the former, which in the F_3 generation was equally virulent on Gothland with the *U. avenae* parent but less so on Monarch than the buff smut progenitor.

ARND (T.) & SEGEBERG (H.). **Über das Wasserverbindungsvermögen des Torfes und dessen Zusammenhang mit den sog. Bodenkrankheiten (Urbarmachungskrankheit u. a.).** [On the water-binding capacity of peat and its connexion with the so-called soil diseases (reclamation disease, &c.).]—*Z. PflErnähr. Düng.*, A, xliii, 3–4, pp. 134–142, 3 graphs, 1936.

The consensus of opinion among workers on the reclamation disease of cultivated plants [*R.A.M.*, xv, p. 461] is that the bog soils on which it is most liable to occur are typically structureless, evidently because the colloids in such soils exert a binding action under moist conditions, with the result that on drying out, the capillaries close and the underground water is unable to rise to the surface. This would explain Hudig's observation (*Z. PflErnähr. Düng.*, viii, p. 14) that the disorder sometimes appears in the course of a few hours on hot summer days, when its symptoms closely resemble those of heat or frost injury. The copper sulphate commonly applied for the control of reclamation

disease, being an electrolyte, acts as a coagulant and converts the fixed capillary system into a movable one. When the soil dries out, the capillaries remain open and permit the passage of the underground water to the surface, where it replenishes the moisture lost by evaporation. Another remedial effect of copper sulphate consists in the formation of copper humate which covers both the inner and outer surfaces of the soil particles and facilitates irrigation.

Although definite proof of the truth of this working hypothesis is still lacking, the authors' preliminary experiments [technical details of which are given] on sphagnum peat at the Prussian Bog Experiment Station, Bremen, suggest that it may well be accepted as a basis for further investigations.

Böning (K.) & Wallner (F.). **Welke, Fusskrankheit und andere Schädingungen an Mais durch Colletotrichum graminicolum (Ces.) Wilson.** [Wilt, foot rot, and other damage to Maize caused by *Colletotrichum graminicolum* (Ces.) Wilson.]—*Phytopath. Z.*, ix, 1, pp. 99–110, 7 figs., 1936.

During the summer of 1935 yellow Baden maize at the Bavarian Agricultural and Plant Protection Institute was severely affected by a hitherto undescribed wilt and foot rot, the agent of which was isolated in pure culture and identified as *Colletotrichum graminicolum* [*R.A.M.*, xv, p. 280]. The fungus [which is described in detail] was shown to be seed-borne, infected seed being marked by black spots or streaks on the surface. Inoculations of seed, of both seed and seedling, and of soil gave positive results (73, 71, and 58 per cent., respectively). The taxonomy of *C. graminicolum* and its distribution on other hosts are discussed. In addition to the synonyms listed by Wilson (*Phytopathology*, iv, [p. 106], 1914), the following are considered to be identical with *C. graminicolum*: *Vermicularia graminicola*, *V. affinis*, *V. culmifraga*, *V. graminum*, *V. relicina*, *V. bohlenae*, *V. melicae*, *V. graminella* [*R.A.M.*, viii, p. 290], and, judging from the diagnoses, *C. lolii* (Fautr.) Zimm., *C. vermicularia*, *C. jaczewskii*, and *C. andropogonis* [ibid., vii, pp. 231, 711].

Koehler (B.). **Entry of Fusarium moniliforme and Cephalosporium acremonium into growing Corn ears.**—Abs. in *Phytopathology*, xxvi, 2, pp. 98–99, 1936.

Apparently sound ears of dent maize were dissected in five stages of development, and parts plated. In the 500 ears plated, the possibility of the entry of fungi through the shank was almost entirely excluded. *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, xv, p. 289] penetrated all infected ears through the tip, passed downward along the silks, inward along the kernel surfaces, then along the bracts and pedicels, and finally reached the vascular cylinder of the cob in 8 per cent. of the ears in the milk stage and in 46 per cent. of mature ones. *Cephalosporium acremonium* [ibid., xiii, p. 572] was detected almost as frequently as *G. moniliformis* in the ears well protected by husks and free from worms, but its incidence was not greatly augmented by injury at the tip. Its path of entry was also the same in at least 90 per cent. of the diseased ears.

Camp (A. F.) & Reuther (W.). **Progress in zinc sulfate studies.**—*Proc. Fla hort. Soc., 1935*, pp. 59–61 [? 1935. Abs. in *Chem. Abstr.*, xxx, 9, p. 3152, 1936.]

Zinc sulphate sprays were found to give the best control of frenching or mottle leaf of citrus in Florida [*R.A.M.*, xiv, p. 441: cf. also xv, p. 363] when applied from 1st February to 1st July. The spray should be composed of zinc sulphate (89 per cent.) 5 lb. and high-grade hydrated lime 2½ lb. per 50 to 100 galls. water. Lime-sulphur may be added if desired. Excessive precipitation of sulphur occurs when zinc sulphate is added to lime-sulphur without hydrated lime. On severely frenched trees the fruit is small, hard, with a low juice and a very low acid content, both of which are materially increased by the use of zinc sulphate sprays.

Fernandes e Silva (R.). **A podridão preta e a podridão peduncular dos Citrus.** [Black rot and stem-end rot of Citrus.]—*Bol. Minist. Agric. Rio de J.*, xxiv, 10–12, pp. 13-24, 4 figs., 1935. [Received April, 1936.]

Both black rot (*Diplodia natalensis*) and stem-end rot (*D. natalensis* and *Phomopsis* [*Diaporthe*] *citri*) [*R.A.M.*, xv, p. 212] having been found to occur on citrus fruits in Brazil, the writer summarizes some outstanding work on these diseases and their control by various well-known American phytopathologists.

Leonard (E. R.). **The storage of Trinidad Citrus fruits.**—*Mem. Low Temp. Res. Sta., Trin.*, 2, 47 pp., 11 graphs, 4 diags., 1936.

In this preliminary account of investigations in Trinidad into the storage behaviour of grapefruit and oranges it is stated that fungal wastage of grapefruit between picking and cold storage was low and due almost entirely to *Botryodiplodia theobromae* [*R.A.M.*, xiv, p. 754]. In trials at 40° F. no wastage occurred during 20 days in quailed and 30 days in unquailed grapefruit, but on transference to a higher temperature the chill blemishes afforded points of infection and occasioned wastage in excess of that observed in fruit originally stored at 53°. At 45° *B. theobromae* appeared early during storage. *Penicillium digitatum* [loc. cit., xv, p. 363] showed a steady increase, and *Colletotrichum gloeosporioides* [see next abstract] seldom developed until after 50 days. At 53° considerable wastage took place, chiefly caused by *B. theobromae* and *C. gloeosporioides*. During distribution the incidence of wastage varied considerably, even from crate to crate.

For most of the season wastage in grapefruit from the packing-sheds was confined to *B. theobromae*, *C. gloeosporioides*, *P. digitatum*, and *P. italicum*, but in earlier consignments received direct from the plantations *Dothiorella* [*Botryosphaeria*] *ribis* [ibid., xiii, p. 249; xv, p. 238], *Oospora* sp., *Fusarium lateritium* var. *fructigenum* [*F. lateritium*], *Eidamia* sp., and *Aspergillus niger* also occurred. *P. digitatum* was scarce in the early trials but tended to become the commonest rot in mid-season, whereas *C. gloeosporioides* tended to decrease throughout the season.

A storage trial with Cocoa oranges at 45° showed the extreme importance of reducing the quailing period to a minimum, the total

fungal wastage developing during quailing, storage, and distribution amounting to 37·5 per cent. in fruit quailed 10 days and only 7·5 per cent. in that quailed 2 days, the fungi involved being *B. theobromae*, *P. digitatum*, and *P. italicum*. Indications of chilling injury are not so marked as in grapefruit, but the presence of numerous primary and secondary fungi, including *Phomopsis* [*Diaporthe*] *citri* [see preceding abstract] and *C. gloeosporioides*, indicated that the resistance of the fruits to infection had decreased as a result of low temperature injury.

In a trial with Valencia oranges, no fungal wastage occurred in storage for 30 days in quailed or for 38 days in unquailed fruit at 40°, 45°, and 53° whilst wastage during distribution amounted to 39, 24, and 51 per cent., respectively in quailed fruit and 67, 18, and 36 per cent. in the unquailed. In King oranges stored at 45° and 50° fungal wastage was negligible and with Satsuma oranges stored at 40°, *P. digitatum* caused 4·3 per cent. wastage.

CHAUDHURI (H.). **Diseases of Citrus in the Punjab.**—*Indian J. agric. Sci.*, vi, 1, pp. 73–109, 8 pl. (4 col.), 1 map, 1936.

In the Punjab citrus wither-tip (*Colletotrichum gloeosporioides*) [*R.A.M.*, xii, p. 369; xv, pp. 361, 364] occurs in an epidemic form in many localities on *Citrus poonensis* (an orange of the mandarin type known locally as 'santara') and on 'malta' orange (*C. sinensis*). Orchards situated at the foot of the hills suffer most. Great loss is caused by the dropping-off of immature fruits, while young plants may be killed outright.

Several strains of the fungus differing in spore measurements, permanent growth characters, and virulence have now been isolated; different sex characters were shown by the different monosporous cultures, and when two cultures were grown together complete fusion was shown in some cases, while in others a space or a white line developed between them. No fruit bodies were formed.

Successful inoculations of healthy plants were effected with *C. gloeosporioides*, but evidence was obtained that some of the severest injuries associated with the disease may be due to infection by the fungus in association with others. Unfavourable soil and climatic conditions or injury by hail are contributory factors favouring the growth of the parasite. The susceptible Blood Red variety of the 'malta' orange was found to be somewhat resistant when grafted on 'kimb' stock, the Valentine variety of malta orange remaining unaffected when grafted on Eureka lemon. Only plants on 'khatta' [*Citrus aurantium*] stocks developed typical wither-tip.

In the Punjab, citrus chlorosis [ibid., i, p. 216; xiv, pp. 561, 753] is characterized by a leaf mottle and early defoliation. Spraying with ferrous sulphate 0·0001 per cent. solution twice a year was found to assist recovery.

Though not much damage is done to citrus leaves by sooty moulds, affected fruits acquire a bitter taste. Fungi commonly found associated with the condition were *Acrothecium lunatum* [*Curvularia lunata*: ibid., xiii, p. 475], *Capnodium citri* [ibid., xiii, p. 693], *Cladosporium herbarum* var. *citricola* [ibid., xi, p. 223], *Alternaria citri* [ibid., xiv, p. 628], *Chaetomium* sp., *Pleospora herbarum*, and

Aspergillus sp. *Altemaria citri* may also bring about the fall of immature fruits and cause a dry internal rot, entering the fruit either at the stylar or stem end. For the control of wither-tip and associated diseases Bordeaux mixture (5:5:50) was the most effective spray tested, especially when used with ferrous sulphate as a sticker. Against sooty moulds Bordeaux-oil emulsion, Bordeaux with rosin, and Bordeaux-rosin with nicotine sulphate gave excellent results. Manurial treatment improved the general condition of the plants, but did not prevent the development of wither-tip.

Broadley (E.). **Use of oil sprays in the control of sooty mould of Citrus fruits.**—*Hadar*, viii, pp. 84–85, 1935. [Abs. in *J. Soc. chem. Ind., Lond.*, lv, 24, p. 516, 1936.]

Both the sooty mould of citrus fruits (*Capnodium citri*) [see preceding abstract] and the wax scale (*Ceroplastes floridensis*) associated with it are stated to be controllable in Palestine by spraying with 2·5 per cent. oil emulsions.

Tomkins (R. G.). **The micro-biology of fruit.**—*J. Soc. chem. Ind., Lond.*, lv, 11, pp. 66T–70T, 1936.

It is estimated that from 2 to 3 per cent. of the total imports into England of citrus fruit are lost through the green rot due to *Penicillium digitatum* [see above, p. 495]. The following counts of this organism were made in consignments of oranges from various countries (*a*) by shaking five pieces of skin 0·1 sq. cm. in area with water, adding this to malt agar, and counting the resulting colonies, and (*b*) by placing ten pieces of skin of the same size directly on the surface of nutrient agar and noting the fungal growth: South Africa, Eastern Province, (*a*) 10 and (*b*) 36 spores per sq. cm.; Northern Transvaal, (*a*) 22, (*b*) 4; Natal, (*a*) 15, (*b*) 24; Eastern Transvaal, (*a*) 8, (*b*) 18; Brazil, (*a*) 20, (*b*) 5; U.S.A., (*a*) 8, (*b*) 6; Spain, (*a*) 6 and 84, (*b*) 10 and 10. In comparison with these numbers the incidence of *P. italicum* was negligible (maximum 4 spores per sq. cm.).

The losses in South African lemons, oranges, and grapefruit after 19 days' storage amounted to 27, 10, and 4 per cent., respectively, when no spores were added, and to 50, 24, and 16 per cent., respectively, when the fruit was inoculated with *P. digitatum*. In experiments on the detection of fruit injuries by various stains, ferric chloride showed up relatively obvious damage, while thionin-blue (1 per cent. in 0·5 per cent. phenol) has given valuable indications in bringing out defects caused by grit and box rub. The susceptibility of oranges to green mould is increased by treating them with rising concentrations of hydrochloric acid followed by washing and inoculation.

The maximum temperature for the development of green mould is about 30° C., but storage at high temperatures is not a practical means of combating the disease owing to the adverse effect of heat on the flavour of the fruit. Control measures should be based on the reduction of the spore-load (by curtailing the period of wilting before packing and cleaning and disinfecting the lug boxes), careful handling to minimize the risk of wounding, and the retardation of rot development by storage at 40° F.

Ocfemia (G. O.), Manzo (I. C.), & Celino (M. S.). **The gum disease of Citrus occurring in the Philippines**—*Philipp. Agric.*, xxiv, 10, pp. 811–838, 8 figs., 1936.

After a brief reference to the literature dealing with the gumming disease of citrus in various parts of the world the authors give an account of their own investigations of the condition in the Philippine Islands, where it was found to be destructive in old and neglected plantings of the four important commercial varieties of *Citrus*, namely, Batangas mandarin (*C. nobilis*), sweet orange (*C. sinensis*), pomelo (*C. maxima*), and calamondin (*C. mitis*), in descending order of susceptibility. The disease chiefly affects the trunk and the larger limbs of the trees, but twigs and the fruit may also be attacked, infection being most severe at the base of the trunk within 1 m. from soil-level, where the lesions may girdle the trunk and eventually kill the tree. Citrus seedlings are also attacked and sometimes killed by the disease. The effects of the disease are more conspicuous during the dry season than in the rainy months.

Isolations from affected tissues consistently yielded *Fusarium solani* [ibid., xiii, p. 631], which was present in practically all the specimens examined and reproduced the disease when inoculated in pure culture through wounds [cf. loc. cit.]; it was not capable, however, of penetrating uninjured bark. Inoculations with the fungus on Batangas mandarin and sweet orange resulted in slight gum formation but extensive rotting, whereas on pomelo and calamondin the lesions were characterized by copious exudation of gum with slight rotting of the bark; slight callus formation was observed round the lesions in the three last-named hosts.

Besides *F. solani*, some of the diseased specimens contained a species of *Diplodia* which is tentatively referred to *D. natalensis* [ibid., xv, p. 364 and next abstract], and one yielded a species of *Hypomyces*, tentatively identified as *H. haematococcus* [*Nectria haematococca*: ibid., xiv, p. 742]. Both fungi were shown to be capable of producing a type of gum disease.

Limited trials showed that the disease may be controlled by cutting out infected bark down to the healthy wood, disinfecting the wounds with 1 in 1,000 mercuric chloride, and dressing them with coal-tar.

Brooks (C.) & McColloch (L. P.). **Some storage diseases of Grapefruit.**—*J. agric. Res.*, lii, 5, pp. 319–351, 6 pl. (1 col.), 3 figs., 1 graph, 1936.

A tabulated account is given of the authors' studies of the factors favouring the development in the grapefruit of the following storage troubles: pitting [*R.A.M.*, xi, p. 570], two forms of which are distinguished: 'definite' pitting, referring to pits 0·2 in. or more in diameter and depressed to a fairly uniform depth of about $\frac{1}{32}$ in., and 'mild' pitting, which is less pronounced than the former; scald [loc. cit.]; oleocellosis [ibid., xiv, p. 755]; browning of the oil cells; and watery breakdown of the fruit; the last-named is a low-temperature disease of rather common occurrence in fruit picked late in the season, in which the peel or flesh (more often both) becomes soft, spongy, and water-soaked, giving the fruit the appearance of having been frozen, and after

removal from storage the fruit develops a disagreeable odour of fermentation. Various bacterial forms were readily isolated from pitted tissue, some of which (and more particularly one, the characters of which are described) reproduced the pitting when inoculated into sound grapefruit peel; there was, however, collateral evidence indicating that the bacteria are not the primary cause of the condition. The development of both types of pitting was favoured by low humidities in storage. Definite pitting was much more severe at 36° and 40° F. than at 32°, while mild pitting was somewhat worse at the latter than at the former temperatures; both types were practically eliminated at 50°. Scald and watery breakdown were worse at 30° and 32° than at 36° and 40°. Pre-storage temperatures of 60° to 75° definitely decreased pitting in storage at 36°, and heating the fruit before storage for 17 to 22 hours at 100° resulted in a very considerable decrease of pitting at 36° or 40°, but in many cases gave a definite increase of pitting in fruit stored at 32°. Scald was much worse on heated fruit, especially on that stored at 32°. Practically none of the troubles developed in fruits which, after one or two weeks at lower temperatures, were permanently removed to 50°. Exposing grapefruit for 20 to 48 hours to atmospheres containing 20 to 45 per cent. carbon dioxide before low temperature storage resulted in a definite decrease in the subsequent development of pitting, the best results being obtained with the longer treatment and higher percentages of gas; the same amount of control was also obtained by storing the fruit in paraffin or cellophane [ibid., xiii, p. 694] wrappers, while excessively oiled wrappers gave even better control; the best control of pitting was given by coating the fruit with mixtures of mineral oil and wax, but this treatment sometimes caused an increase in scald and watery breakdown, especially in storage at 32°. Fruit stored at 50° soon developed a high percentage of stem-end rot [*Diplodia natalensis*: ibid., xi, p. 570; xv, p. 291], but fruit held at 40° or lower usually showed no decay at the end of eight weeks' storage.

Vrijdagh (J. M.). **Contribution à l'étude de la maladie des chancres des tiges du Cotonnier.** [Contribution to the study of the Cotton stem canker disease.]—*Bull. agric. Congo belge*, xxvii, 1, pp. 3–37, 10 pl., 2 figs., 1936.

The results of the author's histological studies [details of which are given] of cotton stems affected with stem canker in the Belgian Congo, together with those of previous investigations [*R.A.M.*, xiii, p. 231], are stated to have shown conclusively that the condition is primarily due to the activities of the mosquito bugs *Helopeltis bergrothi* and *H. sanguineus*, without the co-operation of any micro-organism.

Lewin (C. J.). **Agriculture in the Territory.**—*Rep. Dep. Agric. N. Rhod., 1935*, pp. 3–7, 1936.

The following item of phytopathological interest occurs in this report. Considering the vast scale of the return migration of the red locust (*Nomadacris septemfasciata*) during the latter part of 1934 and early 1935, hopper hatchings were unexpectedly small, probably largely on account of the infestation of the parent swarms by *Empusa grylli* [*R.A.M.*, xv, p. 216] and *Metarrhizium anisopliae* [ibid., xiv, pp. 429, 629].

CIFERRI (R.). **Sulla posizione sistematica dell'Aegeritha duthiei, fungo dell' 'ambrosia' dei termitai.** [On the systematic position of *Aegerita duthiei*, the fungus of the 'ambrosia' of termites' nests.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, pp. 229–246, 6 figs., 1935. [Latin and English summaries. Received April, 1936.]

After reviewing earlier studies on fungi attacking termites [cf. *R.A.M.*, xiv, p. 167] the author gives a full account of *Aegerita duthiei* [*R.A.M.*, v, p. 423] found in the nests of *Nasulitermes morio* in the Dominican Republic. Beside the whitish conidial stromata, ellipsoidal or ovate chlamydospores 6 to 12 by 5 to 10 μ are found. The conidiophores are swollen at the apex and bear chains (sometimes branched) of 2 to 7 conidia, which measure 6 to 18 by 4 to 15 μ, those nearer the centre being smaller and elliptical or cylindrical, the outer ones large and spherical. A few intercalary chlamydospores were obtained in culture with indications of clamp-connexions. As the author considers the genus *Aegerita* is characterized by solitary (never catenulate), monomorphous conidia, he transfers the species to a new genus *Termitosphaeria* as *T. duthiei* n. comb., a Latin diagnosis of the genus being given.

MOORE (M.), KILE (R. L.), ENGMAN (M. F.), & ENGMAN (M. F.). **Pityrosporum ovale (bottle bacillus of Unna, spore of Malassez). Cultivation and possible role in seborrheic dermatitis.**—*Arch. Derm. Syph., Chicago*, xxxiii, 3, pp. 457–472, 7 figs., 1936.

In the horny layer of tissue and hair follicles of persons suffering from seborrhoeic dermatitis the fungus *Pityrosporum ovale* [*R.A.M.*, xii, p. 442; xiv, p. 696] commonly appears in the form of ovoid or spherical cells, 2 to 4 μ long, with some spherical, thick-walled structures up to 11 μ in diameter. In acute, rapidly spreading conditions, the cells are generally ovoid, 3 μ long, with small, flask-shaped buds. Contamination by saprophytic yeasts and fungi is very liable to confuse the clinical picture. In cultures on Difco wort agar the colour of the colonies ranges from pale ochraceous salmon to pinkish-buff. On different media the cells may either occur singly, in oidial chains, or in an elongated, sclerotic form. A condition simulating seborrhoeic dermatitis was induced in human patients, rabbits, and guinea-pigs by inoculation through excoriated areas of the skin and other methods.

DE CISNEROS (J. M. G. J.). **Il valore dei mezzi naturali per lo studio dei dermatofiti. II. I mezzi naturali vegetali, i loro derivati ed i mezzi batterici.** [The value of natural media for the study of dermatophytes. II. Natural plant media, their derivatives and media containing bacteria.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vii, pp. 75–101, 9 figs., 1936. [Latin summary.]

The author describes an investigation carried out on 15 species of dermatophytes to test the validity of the view expressed by Langeron and Milochevitch [*R.A.M.*, ix, p. 781] that media containing polysaccharides and natural media are particularly favourable to the growth of these organisms. On wheat and barley seeds the best growth was shown by *Epidermophyton* [*Trichophyton*] *purpureum*, which produced

abundant red pigment; *Achorion schoenleini*, *Microsporon ferrugineum*, *T. acuminatum*, and *A. quinckeanum* grew well but slowly. *T. rosaceum* [ibid., xv, p. 219] and *M. audouini* grew very poorly, and on barley seed only. *T. violaceum* and *Endodermophyton* [*T.*] *indicum* [ibid., xiv, p. 308; xv, p. 152] showed practically no growth. Microscopically, the same characters were seen as on ordinary media. The mycelium was in all cases much less vigorously developed than on ordinary media and polymorphism rapidly set in.

Horse manure was strikingly unfavourable to growth except in the case of *A. gypseum*, *T. asteroides*, *T. cerebriforme*, and *T. acuminatum*, all the other fungi growing very poorly or not at all.

On wheat meal agar nearly all the organisms grew well and chlamydospore development was profuse. On dextrin agar and peptonized starch agar all the fungi except *A. gypseum*, *A. schoenleini*, and *E.* [*T.*] *niveum* [ibid., xiv, p. 218] made extremely poor, atypical growth.

From these results the author concludes that in the study of the dermatophytes natural media and media containing polysaccharides are only of very limited value and consequently the classification of the dermatophytes suggested by Langeron [ibid., x, p. 242] must be regarded as inadequate.

KROEMER (G.). **Über die bisher bekannten menschlichen Cephalosporium-Infektionen, nebst Untersuchungen über zwei verschiedene Stämme von Cephalosporium acremonium Corda.** [On the human *Cephalosporium* infections hitherto recognized, together with studies on two distinct strains of *Cephalosporium acremonium* Corda.]—*Z. Parasitenk.*, viii, 3, pp. 317–331, 8 figs., 1936.

The writer summarizes the literature on *Cephalosporium* infections of man [cf. *R.A.M.*, xv, p. 93] and discusses the propriety of Benedek's renaming of Grütz's species (*C. acremonium*) [ibid., xv, p. 220] as *C. asteroides griseum grützii* (cf. ibid., xiv, p. 405]. A comparative investigation of the strain isolated by Grütz with a culture of *C. acremonium* Corda from Baarn revealed a close agreement in respect of their morphological, cultural, and physiological characters, as well as in their pathogenicity to laboratory animals, while conclusive proof of identity is considered to be afforded by hyphal anastomosis between the two strains [cf. ibid., xiii, p. 768]. Grütz's species may therefore safely be referred to *C. acremonium*.

NIIZAWA (S.). **Ueber die Dermatomycosen bsd. Favus in dem Lehoshan, Dakushan, Tonrian und Supingai in 'Manchoukuo'.** [On the dermatomycoses, especially favus, in the Lehoshan, Dakushan, Tonrian, and Supingai districts of Manchukuo.]—*J. orient. Med.*, xxiv, 3, pp. 605-612, 2 pl., 10 figs., 1936. [Japanese, with German summary on p. 34.]

Clinical and microscopic studies are stated to have been made in connexion with 24 cases of favus in four administrative districts of Manchukuo, with the result that the agent of the trouble in all the patients was determined as *Grubyella schoenleini* var. *mongolica* [*Achorion schoenleini* var. *mongolica* (Hashimoto and Ota) Dodge: *R.A.M.*, vii, p. 170].

Ota (M.). **Étude morphologique et taxonomique sur quelques Dématiées arthrosporées, blastosporées et aleuriosporées, pathogènes pour l'homme.** [A morphological and taxonomic study of some Dematieae with arthrospores, blastospores, and aleuriospores, pathogenic to man.]—*C. R. Soc. Biol., Paris*, cxxi, 12, pp. 1187–1189, 1936.

The genus *Torula* Pers. has been interpreted by Langeron [*R.A.M.*, viii, p. 173] as including only black-pigmented, filamentous fungi capable of forming blastospores, e.g., *T. jeanselmei*. On the other hand, Castellani's *Cryptococcus* [or *Cladosporium*] *metaniger* [ibid., xii, p. 219] is not primarily a thallosporous, blastosporous fungus (although a few incipient blastospores have been observed in culture), but is characterized by well-developed, narrowly septate arthrospores, for which reason it should be referred to *Circinotrichum* Nees as *C. metaniger*. Recent inoculation tests with this organism on rabbits, guinea-pigs, and mice showed it to be pathogenic only to the last-named.

In 1934 a Japanese worker named Kanô isolated from verrucose facial lesions in a young woman a species of *Hormiscium* which he named *H. dermatitidis*. The fungus was shown by inoculations on animals to be the agent of the disease.

Glenospora graphii [ibid., ix, p. 782] is the type species of aleuriospore-forming Dematieae pathogenic to man and consequently the writer's reference of *G. albiciscans* [ibid., iv, p. 479], the cause of Nieuwenhuis's dermatosis (tinea albigena), to this genus is incorrect. In 1930 Nannizzi [apud Agostini] transferred the agent of tinea albigena to *Glenosporella* [ibid., x, p. 458], the distinction between which and *Aleurisma* Link appears to the writer dubious. Should the separation, however, be maintained, *Glenospora gammeli* [ibid., xiv, p. 100] should also be transferred to *Glenosporella*.

Acladium castellanii [ibid., xv, p. 20] is characterized by dark brown to subfuliginous thalli and should, therefore, be placed among the Dematieae under *Glenospora* rather than in its present position with the Mucedineae. Serious injuries developed in animals inoculated with this organism in recent tests.

Kurotchkin (T. J.). **Variation of colonial characters of certain yeast-like fungi.**—*Chin. med. J., Suppl.*, I, pp. 171–178, 2 pl., 1936.

The writer describes his cultural studies on four strains of *Monilia* [*Candida*] *bronchialis* [*R.A.M.*, xiv, p. 509], two each of *M.* [*C.*] *tropicalis*, *M.* [*C.*] *pinoyi* [ibid., xv, p. 439], and *M. guilliermondi* [ibid., xii, p. 568], and one of *M.* [*C.*] *psilosis* [ibid., xiv, p. 444], identified mainly on the basis of fermentation tests. With the exception of one strain of *C. bronchialis* and that of *C. psilosis*, both of which frequently formed rough colonies after 8 to 10 days, the smooth aspect of the whitish circular cultures on Sabouraud's glucose agar persisted indefinitely; repeated transplants from the rough and smooth colonies of the two strains showed each type to be unstable, the character for roughness presumably depending on some physical environmental factor. In further experiments it was ascertained that roughness could be induced at will in all the species used, except one strain of *C. tro-*

picalis, by the addition to the medium of 8 to 10 per cent. peptone [cf. ibid., xv, p. 294], which evidently stimulates the surface growth of the fungal colony.

JORDON (J. W.) & WEIDMAN (F. D.). **Coccidioidal granuloma: comparison of the North and South American diseases with special reference to Paracoccidioides brasiliensis.**—*Arch. Derm. Syph., Chicago,* xxxiii, 1, pp. 31–47, 6 figs., 1936.

Coccidioides immitis [*R.A.M.*, xv, p. 221] is stated to be firmly established as the agent of most, if not all, of the cases of North American coccidioidal granuloma recorded up to the present, and is also known to have caused the disease in two South American (Argentine) patients. On the other hand, the numerous cases in Brazil of a disease hitherto regarded as coccidioidal granuloma are attributable to a radically different fungus, *Paracoccidioides brasiliensis* [ibid., xii, p. 234; xiv, p. 631], two strains of which were secured for comparison with *C. immitis*. Not only did the two organisms differ markedly in their morphological and cultural characters, but their effect on laboratory animals was divergent, *C. immitis* being extremely virulent while *P. brasiliensis* gave almost exclusively negative results in pathogenicity tests. In the writers' opinion, the disturbances occasioned by *P. brasiliensis* are not properly referable to coccidioidal granuloma but should be known as 'Almeida's disease'.

MACKINNON (J. E.). **Description d'une souche de Phialophora verrucosa Thaxter (Medlar, 1915) isolée du premier cas de dermatite verruqueuse observé en Uruguay.** [Description of a strain of *Phialophora verrucosa* Thaxter (Medlar, 1915) isolated from the first case of verrucose dermatitis observed in Uruguay.]—*Ann. Parasit. hum. comp.*, xiv, 1, pp. 78–84, 1 fig., 1936.

The author's further study of *Phialophora verrucosa* [*R.A.M.*, xiv, p. 509] showed that the form of the fungus found in the lesions is a round, ochraceous, thick-walled body up to 10 μ in diameter, multiplying by direct division and forming conglomerations of 20 to 30 bodies; false budding is sometimes seen. Some old cells have a thick wall and contain a thin-walled spore. On 4 per cent. glucose agar the fungus forms a black growth covered with a dark brown aerial mycelium with a greyish sheen, the colonies reaching 1½ cm. in diameter and 3 to 5 mm. in height within 40 days; old cultures contain a dark brown, diffusible pigment. On Czapek's agar the only aerial mycelium is a small central tuft and the colonies are dark brown, with no diffusible pigment. The hyphae measure 2 to 4 μ in diameter. The fertile ones are generally multiseptate, each segment giving rise to one or two lateral, bottle-shaped phialids, 3·5 μ in diameter and 6 to 10 μ long; the outer membrane forms a collar round the apex within which the round, oval or elongated, hyaline conidia develop centripetally. The rounded conidia measure 1·7 to 2 μ in diameter, and the others 3·7 by 1·7 to 2 μ. Atypical phialids are also described. On Czapek's agar chains of thick-walled, septate bodies resembling arthrospores have been observed. Contrary to the description given by Medlar (*J. med. Res.*, xxxii, pp. 507–523, 10 figs., 1915) no mucilage was observed

grouping the conidia at the extremity of the phialids, and this also applied to Thaxter's original strain.

Beregoff-Gillow (Pauline). **The importance of early diagnosis in mycotic diseases, with special reference to blastomycosis: with a brief report of two cases.**—*Canad. med. Ass. J.*, xxxiv, 2, pp. 152–155, 6 figs., 1936.

After commenting on some cases in the relevant literature illustrating the importance of early diagnosis in blastomycotic diseases, the writer gives notes on the organisms isolated from the sputa of two supposedly tubercular patients at the Women's General Hospital, Montreal. One formed on glucose agar, luxuriant, smooth, white colonies, consisting of round and oval cells, 3 to 7 μ in diameter, some of which budded without any mycelium. All sugars were fermented. The intravenous inoculation of guinea-pigs and rats resulted in the development of multiple abscesses in almost every organ, the lungs in particular being studded with white nodules resembling tubercles. This organism is referred to *Blastomyces* [*Blastomycoides*: *R.A.M.*, viii, p. 103].

The fungus from the second case also grew profusely on glucose agar but fermented no sugars and produced only a little acid in glucose. Mycelial growth in liquid media was scanty. The cultural characters of this organism were those of a *Cryptococcus* and resembled the description of *Torulopsis macroglossiae* [ibid., xiii, p. 162].

Maunder (J. C. J.). **Ergotism in dairy cattle.**—*Qd agric. J.*, xlv, 3, pp. 250–251, 1936.

A brief description is given of the symptoms and treatment of a disease of cattle in Queensland, which resembles staggers, and is caused by the presence on paspalum [*Paspalum dilatatum*] of ergot [*Claviceps paspali*: *R.A.M.*, x, p. 463].

Atkins (W. R. G.). **The preservation of fishing-nets by treatment with copper soaps and other substances.**—*J. Mar. biol. Ass. U.K.*, N.S., xx, 3, pp. 627–641, 1936.

Continuing his experiments on the preservation of fishing-nets by chemical treatment at the Laboratory of the Maine Biological Association, Plymouth [*R.A.M.*, x, p. 733], the writer found frequent treatments with cutch (tannin-containing extracts from various tropical trees) to be injurious, but the application every four months of Olie's method (cutch followed by 10 to 15 minutes' immersion in 1 per cent. ammoniacal copper sulphate) kept cotton netting in good condition for six years and eight months in aquarium sea-water [cf. ibid., xv, p. 91]. A single treatment by Olie's method preserved trawl twines of Benares sann hemp (*Crotalaria juncea*), New Zealand *Phormium* fibre, and East African sisal (*Agave sisalana*) for 34, 34, and over 48 months, respectively, under conditions leading to the decay of untreated material in less than five months. Good results were also obtained with a neutral tar oil derived from the 'coalite' low temperature distillation process (Coalite Works, Gawber, Yorks). Effective mixtures consist of 1 lb. oleate, mixed soaps, or resinate, and 1 lb. coal tar per gall. benzene or petrol. Cuprinol [cf. ibid., xv, p. 413] as now

sold for nets has tar incorporated by the manufacturers. Single treatments with such mixtures have preserved cotton netting up to 3½ years. A copper resinate and coal tar mixture maintained the strength of 2-in. sisal rope at 80 to 97 per cent. of its original value for a year compared with 18 per cent. for the untreated control.

Atkins (W. R. G.) & Purser (J.). **The preservation of fibre ropes for use in sea-water.**—*J. Mar. biol. Ass. U.K.*, N.S., xx, 3, pp. 643–654, 1936.

The results of tests in sea-water at Plymouth in the preservation of fibre ropes [cf. preceding abstract], showed the efficacy of green cuprinol containing tar, 10 per cent. copper oleate in a light coal tar, 10 per cent. copper resinate in 'coalite' heavy oil or creosote, and 10 per cent. copper oleate with 20 per cent. 'coalite' tar in 'coalite' neutral oil, b.p. 100° to 245° C. (a very cheap solvent). All these maintained thin Manila rope at or above 70 per cent. of its initial strength for 10½ months, whereas that of the untreated control was reduced to 13 per cent. Among other mixtures maintaining the rope at 60 to 69 per cent. of its initial strength were 10 per cent. copper oleate and 20 or 10 per cent. coal tar in benzene, 10 per cent. copper oleate and 20 per cent. 'coalite' tar in benzene, and Shell wood and Shell canvas preservative each with 10 per cent. coal tar.

Copper resinate (10 per cent.) in a light coal or 'coalite' tar maintained the strength of material for two to five months; and a very useful and inexpensive dip may be obtained by using 'coalite' neutral oil, b.p. 170° to 230°, as a solvent for the copper resinate. For hard use hardwood tar ('Shalco' from Messrs. Shirley Aldred, Worksop) or softwood (Stockholm) tar may be employed. 'Corroid' coal tar (Messrs. Hardman, Hull) and coalite tar are also particularly recommended. All these tars are greatly improved by the admixture of a copper soap at the rate of 1 lb. per gall.

Bolting silk plankton nets may be preserved by treatment with copper oleate or copper resinate in benzene with no, or very little, tar; but the best results were given by immersion in a dilute solution of copper naphthenate with tar, obtained by mixing 'green cuprinol for nets' with three volumes of petrol. The durability of cotton and flax fishing lines for use on rods can be lengthened by soap and tar solutions in benzene.

A rough idea of the utility as a preservative of a copper or zinc soap may be obtained by testing the treated material with salt or fresh water with the addition of a trace of sodium diethyldithiocarbamate; by this means it is possible to gauge the rate at which traces of copper (golden-yellow) or zinc (white) are being given off.

Kinghorn (W. O.). **Glomerella phacidiomorpha (Ces.) Pet. on Phormium tenax in Britain.**—*Ann. appl. Biol.*, xxiii, 1, pp. 30–44, 1 pl., 2 figs., 1936.

In the spring of 1934 a portion of a neglected crop of New Zealand flax (*Phormium tenax*) growing in Devonshire showed two types of infection, one characterized by oval patches of dead tissue on otherwise healthy leaves, while in the other entire leaves died and turned greyish-

brown, often rolling up along their entire length. In this second type of infection the cuticle peeled off in large flakes, exposing fungal fructifications which in places made the leaves jet black; infection apparently had spread downwards from the tips.

Conidial acervuli were abundantly present on the dead areas and sometimes several joined into a long streak-like pustule running longitudinally between the veins. The conidiophores were about 20 μ long with a few septa, and the solitary, hyaline (orange-red in the mass), slightly granular, unicellular conidia, 19 to 26 by 5·5 to 7·5 μ, varied from subclavate cylindrical, to ovoid-elliptical, occasionally irregularly curved, and usually flattened at the point of attachment. The conidial stage was identified as *Colletotrichum rhodocyclum* with which *Cryptosporium rhodocyclum*, *Phyllosticta haematocycla*, *Fusarium phormii*, *Gloeosporium phormii*, and *Gloeosporidium rhodocyclum* are regarded as synonymous.

The perithecial stage of the fungus, *Glomerella phacidiomorpha* [as established by cultural experiments], occurred all over the dead leaves, usually crowded together. The perithecia were embedded in the tissues, and measured 200 to 300 μ in diameter. The sessile or shortly stalked, cylindrical or spindle-shaped asci, with a thickened truncate apex, measured 50 to 70 by 10 to 15 μ and the ovoid-elliptical to oblong, seldom irregular, unicellular, hyaline, ascospores 12 to 15 by 5 to 6 μ when ripe and dry (14 to 22 μ long when soaked in water). Paraphyses were present but became mucilaginous as the asci ripened. Revised descriptions of the two stages are given.

Inoculation tests showed the fungus to be only weakly parasitic, but it is thought to be a potential source of danger to crops of lowered vitality. The fungus has been reported from New Zealand under the name *F. phormii* [cf. *R.A.M.*, i, p. 295] as causing large leaf blotches, and has also been recently recorded from Latvia [as *Physalospora phormii*: ibid., viii, p. 87] and Kenya [cf. ibid., x, p. 297].

Fuchs (K.). **Krankheiten und Schädlinge unserer Gespinstpflanzen.** [Diseases and pests of our fibre plants.]—*Nachr. SchädlBekämpf., Leverkusen*, xi, 1, pp. 6–28, 13 figs., 1936. [English, French, and Spanish summaries on pp. 53–54, 57–58, 62–63.]

Parallel with the decline of importation of cotton goods into Germany has proceeded an immense extension of the flax-growing area (from 5,000 hect. in 1933 to 30,000 hect. in 1935), and a similar though more restricted expansion of hemp cultivation has likewise taken place during the same period. In this connexion the writer summarizes, with bibliographical references, the available information on the diseases and pests of these two crops, most of the important recent work on which has been noticed from time to time in this *Review*.

Wenzl (H.). **Knospengallen durch Rosenrost. (Bemerkungen zur morphologischen Einteilung der Gallen.)** [Bud galls caused by Rose rust. (Observations on the morphological classification of the galls).]—*Z. PflKrankh.*, xlvi, 3–4, pp. 204–214, 3 figs., 1936.

In October, 1935, the writer investigated an exceptionally heavy outbreak of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*:

R.A.M., xv, p. 22] in the form of galls on the leaf (winter) buds of *Rosa canina* intended for use as stocks in a nursery near Vienna. About every twentieth plant out of several thousand showed at least one infected, hypertrophied bud, while the leaves were also heavily rusted and fell prematurely; on the other hand, there were only a few isolated *Caeoma* pustules on the cortex of the shoots. By reason of the thickening and enlargement of the bud axis and its adherent scales and leaf primordia the affected organs measured up to 20 by 13 mm. The two lateral, normally invisible dormant buds, moreover, were so stimulated as to reach a length of up to 1 cm. *Caeoma* pustules were found on the enlarged bud scales, and even on the minute innermost leaflets and primordia. The hypertrophied buds were found to contain large masses of spores. The bud axis showed an extensive development of the pith and consequent hypertrophy of the vascular bundle ring. Cases were observed in which the diseased buds prematurely produced apparently normal leaflets, the development of which, however, was sooner or later arrested by the injury to the tissues of the axis and the petiole base.

The galls formed by *P. mucronatum* on rose buds conform more nearly to Küster's 'histioid' type than to the 'organoid', though representing a transitional stage in their approximation to the shape of the affected organ. In conclusion, the writer points out some difficulties attending the morphological grouping of certain anomalies of gall formation and briefly discusses the accurate definition of the 'products of the gall-forming agent' in Küster's sense of the phrase.

Slate (G. L.). **Disease among the Lilies.**—*Horticulture*, xiv, 5, pp. 96–97, 1936.

A popular note is given on mosaic [*R.A.M.*, xiv, p. 634; xv, p. 444] and *Botrytis* blight [*B. elliptica*: ibid., xiv, p. 513] of lilies and their control in New York, the former mainly by the use of healthy stock and the latter by regular treatment with Bordeaux mixture 4–6–50 and appropriate cultural measures. The writer has found the following species susceptible to mosaic: *Lilium auratum*, *L. tigrinum*, *L. speciosum*, *L. batemanniae*, *L. chalcedonicum*, *L. sargentiae*, and the *elegans-umbellatum* group, while *L. henryi*, *L. hansoni*, and the Backhouse hybrids appear to be resistant and *L. regale*, *L. tenuifolium*, *L. amabile*, and others commonly raised from seed commercially are much freer from disease than those propagated vegetatively. *B. elliptica* chiefly attacks *L. candidum*, *L. testaceum*, and *L. chalcedonicum*, while *L. croceum*, *L. willmottiae*, and some of the *elegans-umbellatum* group are less susceptible. A basal rot caused by a soil-inhabiting *Fusarium* has given much trouble, and so far the only remedy known is to dig up affected bulbs, immerse them for 30 minutes in 1 in 40 formaldehyde, and replant on another site.

Schmidt (H.). **Die Bandstreifenkrankheit der Nelken.** [The ribbon stripe disease of Carnations.]—*Kranke Pflanze*, xiii, 3, pp. 49–50, 1 fig., 1936.

Both greenhouse and outdoor carnations in Saxony are stated to suffer heavy and increasing damage from the so-called 'ribbon stripe' disease (*Pseudodiscosia dianthi*) [*Heteropatella valtellinensis*: see above,

p. 468]. Whitish-grey, transverse bands, up to 1 cm. in width, encircle the leaf on both sides, or it turns a uniform grey from the tip downwards for about a third of its length. Shoots and pedicels are similarly affected. The infected tissues wilt and shrivel and ultimately the diseased organs collapse; scarcely any marketable flowers are produced. The disease is particularly severe on the Agadir variety, Victory, Aline, and Souvenir of Jesche being much less susceptible. Control should be based on appropriate cultural measures, supplemented by spraying with Bordeaux mixture with the addition of an adhesive paste, tezet 10 S [ibid., xv, p. 380], obtainable from Chem. Fabr. Dr. W. Leonhardt, Hamburg, Gr. Reichenstr. 9.

Beaumont (A.), Dillon Weston (W. A. R.), & Wallace (E. R.). **Tulip fire.**—*Ann. appl. Biol.*, xxiii, 1, pp. 57–88, 2 pl., 1936.

Tulip fire (*Botrytis tulipae*) [*R.A.M.*, xiv, p. 586], caused serious losses in England in 1924, 1928, and 1930, while in 1927 and 1928 infection was so severe in West Cornwall that some growers were unable to market their flowers. Apart from petal blistering, the premature withering of the foliage reduces the production of large bulbs.

B. tulipae is found only on tulips, the reported occurrence of the fungus on other hosts [ibid., iv, p. 285] being probably due to the fact that various species of *Botrytis* are indistinguishable from *B. tulipae* except in artificial culture. There appears to be no inherent varietal resistance to infection under favourable conditions.

Besides the well-known symptoms of 'fire', the fungus causes a second type of symptom, 'spot', i.e., small, dry, slightly sunken, yellowish- or greyish-white, circular spots with a pale grey centre surrounded by a yellow ring, as well as 'bulb rot', when the whole plant is undersized and sickly pale or yellowish-green. Flower-spotting, which often occurs on an epidemic scale, is of two types. In one, the spots are dry, white, and slightly sunken; in the other, 'blister spot', they are white, puckered, raised, and confluent.

The conidia are formed on the living host less readily in low than high light intensities; a 90 to 100 per cent. humidity is necessary for their formation, for which 24 hours suffices at April temperatures. They are very easily detached and are dispersed by wind and splashed off the leaves by rain. Experiments showed that a drop of water falling 13 ft. on to a diseased leaf scattered spores over an area of at least 3 sq. yds. A field with 1·3 per cent. fire lesions more or less uniformly scattered over it would thus be completely spotted by rain, assuming the number of bulbs per acre to be about 120,000. As many as 156 spores were counted in one small splash covering about 3 sq. mm. Since high humidity is necessary for germination and the spores germinate rapidly, this method of dispersal is particularly favourable to infection. In the forcing house the condensation of water on the glass is a fertile source of infection, which may also be transmitted by aphids. The rapidity with which spots develop in the field shows that the spores must start to germinate almost as soon as they alight on the leaf. Conidia kept dry in the laboratory for 30 days gave 100 per cent. germination, which was still vigorous after 50 days; it then declined considerably, though weak germination of a few conidia was still possible after six months.

From 1924 to 1934 high rainfall in March and April was generally followed by a severe epidemic of fire, but in 1932 and 1933 only slight infection resulted as humidity was low. It is doubtful whether temperature is a limiting factor in England, low humidity, which usually accompanies high temperature, probably being the deciding factor.

Control depends on careful handling, annual lifting, cleaning, planting in fresh soil, roguing out and destroying fresh infections, and avoiding wounding; spraying and dusting are only adjuncts. Tests on chemical control, which did not give promising results, showed that 2 per cent. copper sulphate solution was harmless to the sclerotia, that 2 hours' immersion in 0·05 per cent. mercuric chloride solution prevented germination, that after 15 minutes in undiluted formalin only 2 out of 16 pieces of sclerotia grew, and that 5 minutes' immersion in boiling water killed the sclerotia. In another investigation at Cambridge methyl mercuric chloride 1 in 100,000 killed the sclerotia after 2 hours' immersion, though both the same treatment and one at double the strength were harmless to tulip bulbs.

TAKIMOTO (S.). **Bacterial plant diseases in Japan. V. A bacterial disease of pot Marigold.**—*Ann. phytopath. Soc. Japan*, v. 4, pp. 336–341, 3 figs., 1936.

A destructive disease of marigolds (*Calendula officinalis*) first observed near Hukuoka, Japan, in 1935, was found to be due to *Bacterium calendulae* n.sp., which consists of short rods with rounded ends, occurring singly or in pairs, 1 to 2 by 0·5 μ, motile by means of 1 to 3 polar flagella, Gram-negative, forming circular, smooth, flat, dirty white colonies on agar, not liquefying gelatine or coagulating milk, growing well in Uschinsky's and Cohn's solutions, aerobic, producing a small amount of indol, not reducing nitrates; with minimum, optimum, and maximum temperatures for development of 0° to 4°, 27° to 30°, and 37° C., respectively; thermal death point 50°; and a group number *Bact.* 212.2332032. The heaviest damage is caused during rainy autumn weather among dense stands. The mid-ribs of the leaves turn dark brown or black, with large spots on the blades, causing distortion of the foliage and stems. Positive results were given by inoculations by means of spraying or rubbing.

GIBBS (J. G.). **Pelargonium-rust.**—*N.Z. J. Agric.*, lii, 3, pp. 142–147, 4 figs., 1936.

Pelargonium rust (*Puccinia pelargonii-zonalis*) [*R.A.M.*, vi, p. 257] is stated to be common in New Zealand. After a few notes on the morphology and life-history of the fungus, the author describes control experiments the results of which showed that in glasshouses the disease is effectively combated by weekly sprayings of the plants with lime-sulphur containing 0·083 per cent. polysulphides (those containing 0·1 per cent. caused leaf scorch), and outdoors by sprays with 2 lb. colloidal sulphur in 100 galls. water. A good prophylactic measure is to remove the leaves and bracts of cuttings, and to wash the stems thoroughly in running tap water.

Dodge (B. O.) & Reed (G. M.). **Notes on rust diseases of Sempervivum and other ornamentals in the New York area.**—*J. N.Y. bot. Gdn*, xxxvii, 435, pp. 54–59, 4 figs., 1936.

Among the rusts referred to in the notes are *Pucciniastrum myrtilli* [*R.A.M.*, x, p. 532], which is common on the leaves of rhododendron and azalea in nurseries, sometimes destroying quantities of seedlings, and *Endophyllum sempervivi* [ibid., xiv, p. 464] attacking *Sempervivum tectorum*. The latter has not spread widely since its introduction into the country about twenty years ago. The writers traced the growth of this parasite from the leaves down to the crown, and to the new runner shoots during the summer, the offshoot plants developing pustules the following spring. The fungus also penetrated the root system.

Trapp (G.). **A bacillus isolated from diseased plants of Aucuba japonica (Thunb.).**—*Phytopathology*, xxvi, 3, pp. 257–265, 1 fig., 1936.

From necrotic lesions on the stems, leaves, and roots of Japanese laurels (*Aucuba japonica*) affected by die-back, the writer isolated at Glasgow University a new bacillus which he describes in full and names *Pseudomonas aucubicola* n.sp. Inconclusive results having been given by inoculation experiments and the organism being apparently absent from tissue preparations in a state of active necrosis, the bacillus is provisionally regarded as a saprophyte of special habitat.

Spierenburg (Dina). **Een virusziekte in Lupinen (donkere strepen en vlekken op de stengels; afsterven der toppen; gekroesd of violet-bruin blad).** [A virus disease of Lupins (dark stripes and spots on the stems; dying-off of the tops; crinkled or purplish-brown leaves).] —*Tijdschr. PlZiekt.*, xlii, 3, pp. 71–76, 1936.

Lupins in experimental plots at the Wageningen Agricultural College, Holland, were severely affected in the summer of 1935 by a disease apparently corresponding with that reported from Germany and New Zealand under the names of 'browning' and 'sore shin', respectively [*R.A.M.*, xv, p. 101]. Both bitter and sweet (non-alkaloidal) sorts were attacked, the bitter blue (*Lupinus angustifolius*) suffering the heaviest damage; the bitter white (*L. albus*) also developed infection at an early stage, whereas in bitter and sweet yellow (*L. luteus*) the appearance of the symptoms was delayed until autumn, when they assumed an acute form.

The root-collars of diseased plants show a conspicuous brown discoloration both above and below soil-level, with brownish-black stripes and spots extending up the stem and penetrating inwards to the xylem. The larger lesions are frequently covered with masses of *Fusarium* spores. A somewhat bushy aspect is lent to the plants by the profuse branching of the stems. The roots are brown, dead, and often decayed, while the cortex is largely missing, possibly due to infection by *Rhizoctonia* [*Corticium*] *solani*. In yellow lupins the leaves curl inwards, bending slightly upwards so that they resemble claws, and show a somewhat mosaic-like mottling of alternate pale and dark green areas, and brown stripes and spots. The apical shoots are a little twisted; they bend, droop, and finally are mostly shed, leaving a discoloured patch on the stem. The lower leaves shrivel, turn brown, and droop.

The growing tips of the young shoots of blue lupins wilt, twist to one side, and soon fall, while the lower leaves turn purplish-brown and the whole plant rapidly dies; there are no obvious mosaic symptoms. Diseased white lupins present an altogether crinkled appearance, even the leaflets curling upwards; as in *L. luteus* the leaves are mottled and the lower ones droop. Once a lupin of any sort is attacked, the inflorescences either fail to develop or are distorted. Such pods as ripen show a more or less extensive black discoloration, hang downwards in contrast to the erect position of the healthy ones, and ultimately die. The seed is poorly filled, discoloured, and abnormally spotted.

Hiroe (I.). **Brachysporiose of plants. VI. Three new leaf blight diseases of certain plants of the Gramineae and Cyperaceae.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 318–335, 9 figs., 1936. [Japanese, with English summary.]

Comprehensive morphological, physiological, and pathological studies on five strains of *Brachysporium* [cf. *R.A.M.*, xv, p. 266] found, respectively, on rice, chilli (*Capsicum annuum*), *Cynodon dactylon*, *Eleusine indica*, and *Coix lacryma-jobi* var. *frumentacea* in Japan are stated to have demonstrated their complete agreement, and all are accordingly referred to *B. senegalense* Speg. (group IV of the genus). Vigorous growth was made on various media, the colonies presenting a dark grey, cottony aspect with grey or white centres and producing numerous sclerotia on synthetic substrata with asparagin. Moderate sporulation occurred on Saito's onion-soy, apricot, maize meal, and potato agars, and on synthetic media containing asparagin or peptone. The optimum temperature for mycelial development was found to be about 28° [C.], with a maximum of 40°. Positive results were given by inoculation experiments with the five strains on the above-mentioned Gramineae and wheat. The conidia of this group are short-fusiform, with 3 or 4 septa.

Bornhövd (Liselotte). **Beiträge zur Biologie von Ustilago hypodites (Schldl.) Fr. auf Elymus arenarius L.** [Contributions to the biology of *Ustilago hypodytes* (Schldl.) Fr. on *Elymus arenarius* L.]—*Phytopath. Z.*, ix, 1, pp. 69–97, 6 figs., 1936.

A comprehensive account is given of the writer's studies at the Hamburg Institute of Applied Botany on the biology of *Ustilago hypodytes* [*R.A.M.*, xiii, p. 435], a parasite of the dune grass, *Elymus arenarius*, affected plants of which are stated to reach a height 10 to 20 cm. in excess of that of healthy ones and to produce an abnormal profusion of internodes and leaves [cf. ibid., xv, p. 360.] A list is given of 67 grass hosts of the fungus (including 26 species of *Bromus*) on which infection experiments are in progress. The fungus is believed to overwinter in the root system and to be conveyed upwards by means of the new leafy shoot. The mycelium grows both inter- and intracellularly and spores (3 to 5·5 μ in length) are formed basipetally on the stem surface. The optimum temperature for the development of the smut in culture is between 26° and 29° C. and a H-ion concentration of P_H 6·5 to 7·5 is requisite. The germination processes of *U. hypodytes* were

found to resemble those of *U. nuda*. The cytology of the fungus is described in detail.

MacLachlan (J. D.). **Studies on the biology of Gymnosporangium globosum Farl.**—*J. Arnold Arbor.*, xvii, 1, pp. 1–24, 10 pl., 1 map, 1 graph, 1936.

In this account of the diseases caused by *Gymnosporangium globosum* [*R.A.M.*, xiv, p. 368] the author, after giving a list of 12 synonyms, describes the distribution of the fungus, which is confined to the eastern and central parts of the United States and southern Ontario and Quebec. The rust is increasing in prevalence, and is causing great damage in local areas, especially in New York State. On *Crataegus* foliage the first symptoms of infection are visible ten to twelve days after inoculation, and develop three days later into bright yellow spots, 1 to 10 mm. in diameter, on which the spermogonia are formed. If over 50 per cent. of the leaf area is diseased leaf yellowing and defoliation may set in at this stage. Opposite the spermogonia the lower surface of the leaf swells and may be more than five times its normal thickness. The peridia of the developing aecidia become evident about 96 days after inoculation; they may exceed 6 mm. in length, and each lesion may bear from 1 to over 50. High winds and leaf-rubbing cause the peridia to break up and the aecidiospores (most of which are distributed by mid-September) to be released. On *Pyrus* foliage the lesions are smaller and on *Sorbus* and *Malus* they seldom exceed 2 mm. in diameter; certain species of the latter show spermogonia only. Infection of *Crataegus* flowers and fruit is rare and fruit infection of *Pyrus* and *Malus* was not observed. *Crataegus* twigs are relatively rarely attacked, and on the current year's growth only.

On red cedar (*Juniperus*) [*virginiana*] the first symptoms are seen on one-year-old leaves about 1st August. A yellow chlorotic zone or band appears, and is closely followed by the development of a slightly raised area on the upper surface, which splits, allowing the young gall to emerge. In late autumn and winter the galls are smooth, shiny, mahogany-red, and seldom over ½ cm. in diameter. The tongue-like teleutosori, 6 to 12 mm. high, develop the following spring and the teleutospores appear as a cinnamon-brown pulvinate mass. The teleutospores are typically bi- (occasionally tri- or quadri-) cellular, no unicellular ones having been observed by the author. Wetting of the teleutosori by rains in May causes them to expand to many times their original size, owing to the hygroscopic nature of the pedicels. Most of the teleutospores germinate by 25th May, and the dried-up remnants are blown away, leaving a smooth, orange scar bordered by the torn edges of the broken corky epidermis. The galls continue growth during summer, causing distortion and occasionally killing the twig beyond the gall.

Normally the teleutospores germinate within six to eight weeks of their formation, but under low temperature conditions they may remain viable much longer. The aecidiospores show no more than 2 or 3 per cent. germination at the time of formation, but if kept at 0°C. abundant germination can be obtained within a month and more than 80 per cent. by October; from the beginning of March, however, the percentage germination falls off rapidly.

Laboratory tests showed that none of the spore forms germinated unless in direct contact with water, excess of which caused irregularity in the germination percentage, the teleutospores germinated in excess water, but instead of producing basidiospores the promycelia grew to great lengths and sometimes exhibited long side tubes or broke up into elongated, spore-like bodies. The optimum temperatures for the germination of the teleutospores, basidiospores, and aecidiospores were 25° (98·6 per cent.), 20° (83·9 per cent.), and 20° (88·7 per cent.), respectively; at temperatures under 10° and over 30° the germination percentage of all three forms fell to nearly zero.

When aecidiospore infection of red cedars takes place precisely is unknown, but it is thought to occur in late autumn after frosts.

Rothe (G.). **Eine neue Methode zur Berechnung der Spritzbrühenmenge bei der Obstbaumspritzung.** [A new method of calculating the spray volume in fruit tree spraying.]—*NachrBl. dtsch. PflSch-Dienst*, xvi, 2, pp. 13–15, 1 graph, 1936.

By plotting the amount of spray required for the winter treatment of apple trees against the stem circumference an asymptotic curve was obtained with its axis corresponding to the equation $x/45—y/27=1$ where x = stem circumference in cm. and y = litres of spray used. On the basis of this curve the volume of spray liquid required for the treatment of a given tree is calculated, not as heretofore on the basis of its age, but on that of the circumference of its trunk [cf. *R.A.M.*, xi, p. 522]. For winter treatments the spray volume required for a tree with a trunk girth of 20 cm. is 3 l., rising steadily to 65 l. for one measuring 150 cm. For summer applications, which are made with nozzles of smaller diameter, less liquid will be necessary. The annual increase in girth of the trunk of plum, pear, and cherry trees has been estimated by Steglich to average 2·4, 3·1, and 3·7 cm. respectively, compared with 1·5 cm. for apple, and under Loewel's system proportionately greater amounts must be allowed for spraying the former trees (up to 50 per cent. more for cherries than for apples).

Keitt (G. W.) & Nusbaum (C. J.). **Cytological studies of the parasitism of two monoconidial isolates of Venturia inaequalis on the leaves of susceptible and resistant Apple varieties.**—Abs. in *Phytopathology*, xxvi, 2, pp. 97–98, 1936.

A cytological study of apple leaves inoculated in the greenhouse with two strains of *Venturia inaequalis* [*R.A.M.*, xi, p. 461 and above p. 480] showed that in all cases a minute infection hypha penetrated the cuticle directly and gave rise to a dendritic subcuticular mycelium. One strain (22a) was virulently pathogenic to the Yellow Transparent variety but only moderately so to Fameuse, while in 17a the relations were reversed. Missouri Pippin was resistant to both strains. In very susceptible leaves progressive depletion of plastids and cytoplasm, accompanied by increased vacuolation, began to appear about ten days after inoculation in the upper palisade layer in the middle of the lesion, gradually spread throughout the area underlying the fungus, and was succeeded by necrosis. The fungus showed no apparent injury until after the death of the host cells. In moderately susceptible leaves

fungal growth was not so active and the depletion of the host cells correspondingly less extensive, while in the resistant foliage of Missouri Pippin the development of the organism was greatly restricted, only localized epidermal necrosis occurring with 22a and none with 17a.

FARISH (L. R.) & DUTTON (W. C.). **Comparison of several materials for Apple scab control in 1935.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 3, pp. 155–159, 1936.

Details are given of comparative spraying tests in a Grand Rapids (Michigan) orchard in 1935 against apple scab [*Venturia inaequalis*] with 'electric sulphur', lime-sulphur, and Koppers dry wettable flotation sulphur [*R.A.M.*, xiv, p. 591] at various concentrations. It was found that both the 'electric' and dry wettable sulphurs gave satisfactory control at the rate of 6 lb. per 100 galls. spray, provided the operations were started early and repeated with sufficient frequency. In practice, however, a higher concentration would probably be advisable for pre-blossom applications since many growers do not spray very thoroughly.

ZELLER (S. M.) & WILCOX (L. P.). **Nectria canker of Pear.**—*Plant Dis. Reptr*, xx, 5, pp. 83–84, 1936. [Mimeographed.]

Attention is drawn to an unusual case of pear canker (*Nectria galligena*) in an Oregon orchard on heavy clay adobe soil, in which the fungus attacked some newly planted Bartlett and Anjou trees below soil-level. The first sign of infection was observed about 1½ years after planting, the cankers starting near the base and running for several inches in both directions, in many cases more or less girdling the trees. *N. galligena* was isolated from 42 per cent. of the diseased tissues examined, and the imperfect stage *Cylindrocarpon mali* was commonly present in crevices in the bark. Satisfactory control was effected by the excision of the infected areas (or superficial scarification of the bark in milder cases), followed by the application to the wounds of Bordeaux paint, the number of trees lost through the disease being gradually reduced from 400 in 1931 to none in 1935.

PLAKIDAS (A. G.). **Crown girdle of Pear trees.**—Abs. in *Phytopathology*, xxvi, 2, p. 105, 1936.

For some years Chinese sand pears [*Pyrus serotina*] in Louisiana have been affected by an extensive bark canker, starting near soil-level and involving the trunk sometimes as far upwards as the crotch and downwards to the main roots, and finally girdling and killing the tree. A white Basidiomycete associated with the later stages of the disease is believed to be a secondary invader of the tissues between the bark and wood of the trunk, since it failed to produce infection of the living cortex. However, another fungus, probably *Dothiorella* [*Botryosphaeria*] *ribis* [cf. *R.A.M.*, xv, p. 238], constantly found on infected material, produced typical large cankers in inoculation experiments and is thought to be responsible for the initiation of the trouble, which appears to be promoted by freezing injury. The disease also affects apple and tung-oil [*Aleurites fordii* or *A. montana*] trees. Scraping the affected bark and painting the wood with Bordeaux paste has given good control.

ROSEN (H. R.). **The abscission of Pear and Apple blossoms in relation to infection by Erwinia amylovora and Phytomonas syringae.**—Abs. in *Phytopathology*, xxvi, 2, pp. 106–107, 1936.

The examination in the spring of 1935 of abscissed Kieffer and Garber pear blossoms revealed the extensive occurrence of blackish spots on various parts of the receptacles, 64 isolations from which yielded 46 bacteria demonstrated to be pathogenic by inoculation experiments with pure cultures. Of these organisms, 29 were identified as *Erwinia amylovora* [*Bacillus amylovorus*: *R.A.M.*, xv, p. 374] and 17 as *Phytomonas* [*Pseudomonas*] *syringae* [ibid., xv, p. 139], while both were obtained from five of the isolations. Counts of several hundred Kieffer blossoms showed that some 85 per cent. were infected. The poor setting of fruit [in Arkansas] at the time of the investigations was attributed to the extremely heavy rainfall and cloudy days of April and May, but it is evident that this was not the only factor concerned.

ARNAUD (G.) & ARNAUD (M.). **Les maladies à virus des Rosacées amygdalées.** [The virus diseases of Amygdalaceous Rosaceae.]—*C.R. Acad. Sci., Paris*, ccii, 10, pp. 869–871, 1936.

Since 1933 the writers have made a study of some virus disturbances of *Prunus* (sensu lato) [*R.A.M.*, xiv, p. 642] in France. The symptoms, which consist typically in the development of sharply defined yellowish-green, mottled zones in the shape of chevrons, or acute angles on either side of the veins, appear very early in the spring. When the narrow strip of mottled tissue is situated near the edge of the leaf it is apt to break up into discontinuous lines or round, isolated, scattered lesions (a common type of the trouble in peach). The mosaic strips recall the sinuous lines dividing the living from the dead tissue in a leaf undergoing gradual desiccation; they appear to represent zones of equal vitality which may be termed isobiotic foliar lines. In some cases the confluence of two such lines results in the formation of ring spots, ovals, or lozenges. Spontaneous infection of this nature has been observed on apricot, plum, myrobolan, cherry, and peach, while positive results were given by inoculation experiments in the case of apricot (scions from diseased myrobolan and peach), plum (myrobolan), *P. spinosa* (myrobolan), almond (myrobolan), peach (myrobolan, peach), and bird cherry (*P. avium*) with myrobolan and peach scions.

JOËSSEL (P. H.) & LIDOYNE (A.). **Essais de traitements contre la chlorose du Pêcher.** [Experiments with treatments against Peach chlorosis.]—*C. R. Acad. Agric. Fr.*, xxii, 7, pp. 306–311; 8, pp. 315–320, 1936.

In the first part of this paper the writers summarize the results of their experiments in 1933–4 and 1934–5 with Mokrzecki's method (with modifications) of treating peach chlorosis [*R.A.M.*, xiii, p. 384; xiv, p. 319] by means of introducing ferrous salts at the rate of 1 gm. per tree, through two holes, one on each side of the trunk. The 73 trees used in the tests were situated in one locality of Gard and two of Vaucluse. The most satisfactory of the salts used were double tartrate

of iron and potassium and double sulphate of iron and ammonium, the former having completely restored to health a twelve-year-old Amsden peach that had suffered from chlorosis for several years and in 1933 bore nothing but small, unmarketable fruit. As a sequel to treatment on 27th April, 1934, it resumed a normal green coloration, put out shoots 1½ m. or more in length, and produced during the favourable season of 1935 52 kg. of first- and second-grade fruit. Ferrous nitrate and double tartrate of iron and ammonium caused severe injury, while less grave effects followed injection with ammoniacal ferrous citrate. The time of treatment was found to be of great importance, the maximum benefit being derived from applications coinciding with activity in the ascent of the sap. Thus, in a test in 1935 the remedial effects of treatments applied on 12th April were distinctly superior to those given by the same methods on 7th May.

The second part of the paper deals with tests in 1934–5 on the efficacy of the methods of Gris (spraying during the vegetative period with a dilute solution of iron sulphate) and Rassiguier (painting pruning wounds with a very concentrated solution of iron sulphate). The latter procedure was modified by the substitution for pruning wounds of two cuts, 10 cm. in length, on two branches of each tree. Of the salts used, in addition to iron sulphate, at a strength of 30 per cent., double tartrate of iron and potassium was undoubtedly the most effective, followed by citro-ammoniacal pyrophosphate of iron and ammoniacal citrate of iron. The first-named caused practically no scorching and the cuts healed rapidly and perfectly, but there was some desiccation of the branches. Iron sulphate and double sulphate of iron and ammonium also gave good control of chlorosis but caused severe burning of the tissues near the cuts.

In the case of Gris's method, very good results were obtained by the application of double sulphate of iron and ammonium at the rate of some 2½ l. per tree on 24th May, 1935, the other salts used being less effective, though some improvement was effected by pyrophosphate and ammoniacal citrate of iron.

Kunkel (L. O.). **Immunological studies on the three Peach diseases, yellows, rosette, and little Peach.**—*Phytopathology*, xxvi, 3, pp. 201–219, 6 figs., 1936.

Descriptions are given of the symptoms induced in peach seedlings by the rosette [*R.A.M.*, xiv, p. 374], yellows, and little peach viruses [ibid., xiv, p. 705]. The first-named readily invades trees suffering from either of the other diseases, so that there is presumably no close relationship between rosette and yellows or little peach. On the other hand, trees affected by little peach are immune from yellows and vice versa, indicating that these two disturbances should be classified as strains of the same disease, the presence of one of which within a tree automatically protects it against infection by the other.

Buds with yellows transplanted to little-peach trees produce shoots showing typical symptoms of the latter disease and vice versa. Sub-inoculations from these shoots transmit the virus carried by the tree into which the bud was transplanted and not that harboured by the bud at the time of the operation. Hence it is concluded that either

virus may displace the other in the diseased tissues. Trees inoculated simultaneously with both the little-peach and the yellows virus by means of buds inserted at different levels in their stems contract the disease carried by the bud in the upper position, which further attacks any shoot produced by the lower bud. Subinoculations from such a shoot also transmit the disease of the upper bud, whence it may be inferred that the site of inoculation determines the identity of the virus prevailing in a given tree.

Henrick (J. O.). **Diseases of the Raspberry.**—*Tasm. J. Agric.*, N.S., vii, 1, pp. 36–38, 2 figs., 1936.

Notes are given on the symptoms and control of the following raspberry diseases found in Tasmania: mosaic [*R.A.M.*, xv, p. 377], anthracnose (*Plectodiscella* [*Elsinoe*] *veneta*) [ibid., xiv, p. 219], a leaf spot due to a species of *Phyllosticta*, and orange rust (*Gymnoconia interstitialis*) [ibid., xv, p. 237].

Taylor (G. G.). **Application of orchard-sprays. II. The portable spraying-system.**—*N.Z.J. Agric.*, lii, 3, pp. 172–174, 1936.

In this, the second paper of this series [*R.A.M.*, xv, p. 379], the author briefly discusses the advantages and disadvantages of the portable spraying apparatus in use in New Zealand, as compared with the stationary system. Under the local conditions, spraying units consisting of more than two men to each apparatus are not recommended. With a delivery of 3 galls. per minute at each nozzle (or combination of nozzles), the pump capacity required for a one-man outfit is approximately 5 galls. per minute, and for a two-man outfit 8 galls. The maximum mixing-tank capacity practicable is approximately 150 galls. for the horse-driven and 250 galls. for the tractor apparatus. The usual practice with horse-driven apparatus is to have hoses about 60 ft. long, the outfit being moved each time eight trees have been sprayed, while with tractor outfits the hoses are 120 ft. long, allowing large blocks of trees being treated without moving the apparatus. The American method of spraying from platforms on the apparatus while moving has been recently introduced into New Zealand; the principal objection to it is that where trees are dense or overhanging, efficient coverage of the foliage with the spray is difficult to obtain, owing to the limited angle from which the spray can be applied. Generally speaking, the use of portable equipment is advantageous in smaller orchards, up to 5 acres, or where various spray treatments are required for a number of different fruit tree varieties.

Taylor (G. G.). **Removal of spray material accumulated in the pipes of stationary spraying systems.**—*Orchard. N.Z.*, viii, 11, pp. 11–12, 1935. [Abs. in *Hort. Abstr.*, vi, 1, p. 35, 1936.]

Accumulation of spray materials, mostly consisting of large particles of sulphur, lead sulphides, calcium carbonate, and calcium arsenate may so increase frictional resistance in the pipes of some stationary spraying systems [see preceding abstract] as to cause excessive pressure loss. The best of the cleaning agents tested was commercial hydrochloric acid (1 part to 19 of water). The pipes are filled with the acid

solution, the pump being washed out with water as soon as filling is completed. After about half-an-hour the pipes should be emptied and also washed out with water. A second treatment may be required in cases of extensive deposition.

DUBRISAY (R.). **Quelques applications nouvelles de la chimie colloïdale. Produits émulsifs et produits mouillants.** [Some new applications of colloidal chemistry. Emulsive and wetting products.]—*Chim. et Industr.*, xxxv, 2, pp. 267–273, 4 diags., 1936.

The mathematical principles underlying various modern applications of colloidal chemistry are explained and discussed. A formula is given on the basis of which it is deduced that emulsive agents are also wetters by reason of their capillary activity and their addition to fungicides is of great utility in effecting a distribution over leaves and other plant organs [*R.A.M.*, xv, pp. 105, 382]. This theory presupposes the existence of a capillary tension at the level of separation liquid-solid or solid-gas. It has not been possible to demonstrate experimentally the existence of such a tension, but Freundlich has shown (Kapillarchemie. Akad. Verlagsgesellsch., Leipzig) that it may be logically inferred from a number of established facts.

PETERSON (P. D.). **Safe use of sulphur as a fungicide.**—*Proc. Md hort. Soc.*, xxxvii, pp. 60–67, 1935. [Abs. in *J. Soc. chem. Ind., Lond.*, lv, 24, p. 516, 1936.]

A processed form of sulphur, known as catalytic sulphur, added to ordinary lime-sulphur, was found to accelerate the breakdown of the polysulphides and reduce the risk of injury to sprayed foliage. The addition of the same preparation to lime-sulphur-lead arsenate prevented blackening of the mixture.

GODFREY (G. H.). **Control of soil fungi by soil fumigation with chloropicrin.**—*Phytopathology*, xxvi, 3, pp. 246–256, 1 fig., 1936.

Particulars are given of the writer's laboratory experiments at the University of California to determine the practical fungicidal value of chloropicrin as a soil fumigant [*R.A.M.*, xiii, p. 98]. Cultures of *Fusarium* sp. from gladiolus, *Phytophthora cactorum* from snapdragons [*Antirrhinum majus*: ibid., xiv, p. 195], *Rhizoctonia* (*Corticium*) *solani* and *Sclerotium rolfsii* from sugar beet [ibid., xv, p. 194], *Verticillium albo-atrum* from strawberry [ibid., xi, p. 727], *Dematophora* sp. [*Roselinia necatrix*] from apple roots [ibid., xiv, p. 176], and *Armillaria mellea* from prune roots [ibid., v, p. 746] were inserted to a depth of 6 in. next to the wall of 4-gall. glazed stone jars of soil to the centre of which chloropicrin was applied at the rate of 1¼ c.c. per jar (equivalent to 400 lb. per acre ft.). The jars were sealed with gas-impervious, glue-coated paper. The duration of exposure was 48 hours.

None of the fumigated cultures made any growth on nutrient agar plates, whereas all the untreated controls gave positive results. Subsequent small-scale tests on the application of chloropicrin to greenhouse soils naturally infested by pathogenic fungi at the standard rate of 2½ c.c. per cu. ft. gave promising indications, as did also a greenhouse trial of the substance at the rate of 400 lb. per acre for the control of

V. [*albo-atrum* or *V. dahliae*: ibid., xiv, p. 283] on tomatoes. The practicability of disinfecting greenhouse potting soils in special air-tight boxes and of sterilizing laboratory glassware by chloropicrin fumigation was also demonstrated.

TOROPOVA (Mme E. M.). **Manufacture of germisan.**—*Trans. sci. Inst. Fertil. Insectofungicides U.S.S.R.*, 123, pp. 208–210, 1935. [Abs. in *Chem. Abstr.*, xxx, 10, pp. 3576–3577, 1936.]

One kg. of germisan was prepared from 92 gm. tricresol dissolved in 430 c.c. 10 per cent. sodium hydroxide, the solution being cooled to room temperature and 198 gm. mercury oxycyanide gradually introduced to the accompaniment of vigorous agitation. The suspension forming towards the end of the reaction was filtered off and the resultant product left for two to three days, at the end of which a gelatinous product was obtained, undergoing complete liquefaction on heating. Water was removed by careful heating and the hot, semi-solid mass dried in an oven at 40° to 50° C. The dry germisan was ground and mixed with sodium chloride to a mercury content of 16 per cent. The final product (identical with that manufactured abroad) contained: water 10, mercury 54·23, and the yield was 86·3 per cent.

DUFRÉNOY (J.). **Méthodes statistiques appliquées à la pathologie végétale.** [Statistical methods applied to plant pathology.]—*Ann. Epiphyt.*, N.S., i, pp. 147–256, 8 graphs, 1936.

In this comprehensive and detailed study the author attempts to show, by means of numerous examples taken from phytopathology, how statistical methods can be of service in elucidating the causes of pathological phenomena and the etiology of disease. The subjects dealt with include the problems of distribution, the criterion of X^2, Student's method for interpreting paired experiments, and the analysis of variation.

BÖNING (K.). **Der pflanzenschutzliche Beobachtungs- und Meldedienst und seine Aufgaben in der Erzeugungsschlacht.** [The plant-protective observation and notification service and its functions in the production campaign.]—*Prakt. Bl. Pflanzenb.*, xiii, 12, pp. 330–338, 1936.

The writer defines the scope and functions of the branches of the Bavarian Plant Protection Service dealing with the observation of diseases and pests and with the transmission to agricultural and horticultural circles of the information necessary to ensure effective control. A distinction must be drawn between the advisory work (including also the recording of data for statistical purposes) and the purely scientific investigation of disease problems. An improved mode of estimating the extent of injury and corresponding losses from disease is proposed, the degree of damage being classified in categories 1 to 5, indicating 0, 1 to 10, 11 to 20, 21 to 30, and over 30 per cent. reduction of yield, respectively, and studies on the correlation between environmental factors and pathological conditions are advocated [cf. *R.A.M.*, v, p. 370]. In conclusion the need for special instruction in plant protection is emphasized.

JAHN (E.). **Die peritrophe Mykorrhiza. 2. Zur Physiologie und Biologie der Begleitpilze.** [Peritrophic mycorrhiza. 2. Contribution to the physiology and biology of the companion fungi.]—*Ber. dtsch. bot. Ges.*, liii, 10, pp. 847–856, 3 graphs, 1936.

In continuation of his work on the endo-, ecto-, and peritrophic types of mycorrhiza [*R.A.M.*, xiv, p. 247; cf. ibid., xv, p. 308], all three of which very frequently occur in combination, especially in humus soils, where they have been most intensively studied, the author seeks to show that the real function of the mycorrhiza is to render available to the higher plant the mineral salts bound up in the soil, rather than that of exploiting for its benefit the organic nutrients of the humus. In favour of this hypothesis, he adduces the high acidifying properties of some of the fungi (especially the calcicolous species) composing the ecto- and peritrophic flora and cites Lohmann's experiments (*Bot. Arch.*, xxxi, 1931), in which it was shown that *Aspergillus niger* is capable of assimilating considerably more phosphoric acid from the soil than phanerogamic crops, and that its ability to dissolve mineral salts was much higher than that of citric acid of the same P_H value and comparable to that of a fairly strong, hot nitric acid solution. He points out further that mycorrhiza are very much more frequent in long-lived forest trees, which grow for several hundred years in the same place, than in annual or biennial crops which cannot long be cultivated successfully in the same soil without the use of fertilizers. It is also suggested that endotrophic mycorrhiza may sometimes result from the entrance of a peritrophic fungus into the root tissues, the vitality of which is never considerable above the rhizoid zone.

In cultural experiments with silicicolous and calcicolous peritrophic fungi (*Penicillium* sp., an undetermined imperfect fungus, and *Mucor ramannianus*, and another species of *Penicillium*, *Fusarium* sp., and *M. strictus*, respectively) in a malt extract medium with or without the addition of 0·5 or 1 per cent. calcium carbonate, it was shown that in every case a sharp retardation of growth occurred on the malt extract medium after 20 days or somewhat later corresponding to a rise in the P_H value of the substratum, which in most cases was first lowered before the rise took place. All the silicicolous fungi developed more vigorously in the medium without calcium carbonate, while the calcicolous fungi were all stimulated by the addition of this substance. The author concludes from the results of his experiments that the vigour of growth of these fungi is closely related to their capacity of acidifying their substratum.

KRASSILNIKOV (N. A.), KRISS (A. E.), & LITVINOV (M. A.). Влияние корневой системы на микроорганизмы почвы. [The effect of the root system on the soil microflora.]—*Микробиол.* [*Microbiol.*], v, 2, pp. 270–286, 2 graphs, 1936. [English summary.]

Investigations in the Transvolga are stated to have shown that the zone surrounding the roots (rhizosphere) [see preceding abstract] of wheat, maize, sunflower, and soy-beans is densely populated by micro-organisms, the numbers of which exceed by many millions per gm. of soil those found in the control samples. Particularly dense is the

population of the soy-bean rhizosphere, that of the wheat root zone being relatively sparse and of the other two crops intermediate.

A close correlation was observed between the vital activities of the higher plant and the quantitative composition of the soil flora, the first sharp rise in which coincides with the early stages of vegetation and the second with the fruiting period. Microbiological activity increases at the optimum soil moisture content, declining noticeably immediately after the watering of the plots and then rising to a maximum.

Seto (F.). **Comparison of the cellulose decomposition by plant-pathogenic fungi.**—*Ann. phytopath. Soc. Japan*, v, 4, pp. 308–317, 4 figs., 1936. [Japanese, with English summary.]

Most of the 23 fungal pathogens of plants grown on a synthetic mineral salt solution with filter-paper as the source of carbon were found to be capable of utilizing cellulose to some extent, but in most cases the amounts assimilated were not large. Decomposition of cellulose was effected by *Corticium centrifugum* [*R.A.M.*, xv, p. 389], *Fomes applanatus* [*Ganoderma applanatum*: ibid., xv, p. 147], *Gibberella fujikuroi* [ibid., xv, p. 173], *Pestalozzia diospyri* [ibid., ix, p. 536], *Polystictus pergamenus* [ibid., xv, p. 410], and *P. sanguineus* [ibid., xi, pp. 15, 218], but the most active of the organisms tested in this respect were *Gloeosporium olivarum* [ibid., xiii, p. 789], *Pestalozzia theae* [ibid., x, p. 345] and *Sclerotium oryzae sativae* Saw. [ibid., xv, p. 313].

Kobs (Edna) & Robbins (W. J.). **Hydrogen-ion concentration and the toxicity of basic and acid dyes to fungi.**—*Amer. J. Bot.*, xxiii, 2, pp. 133–139, 1 fig., 5 graphs, 1936.

The results of further experiments on the effect of the hydrogen-ion concentration on the toxicity of acid (eosin and rose bengal) and basic (dahlia) dyes to *Gibberella saubinetii*, *Fusarium oxysporum*, and *Rhizopus nigricans* [*R.A.M.*, vi, p. 468] showed that the acid dyes were, in general, more toxic as the acidity of the culture medium increased, and the basic dye was most toxic in the more alkaline solutions; in some cases, however, the toxicity of the rose bengal was reduced by precipitation of the dye in the most acid solutions. It was found that even a fractional change in P_H sometimes had a marked effect on toxicity; so, for instance, whereas at P_H 4 eosin 1 in 1,000 completely inhibited the growth of *G. saubinetii*, at P_H 4·3 it only reduced the growth to 30 per cent. of the normal. It is believed that the effect of hydrogen-ion concentration on the toxicity of dyes is the result of its influence on the formation by the dye of free base or free acid. Correlations between the isoelectric points previously reported [loc. cit.] for the organisms used and the effect of hydrogen-ion concentration on the toxicity of the dyes were not evident in these experiments.

Bond (T. E. T.). **Phytophthora infestans (Mont.) De Bary and Cladosporium fulvum Cooke on varieties of Tomato and Potato and on grafted Solanaceous plants.**—*Ann. appl. Biol.*, xxiii, 1, pp. 11–29, 1936.

The writer describes in detail an investigation made to ascertain whether increase or decrease in susceptibility to pathogenic fungi could

be induced or transmitted by grafting. The material used comprised eight potato varieties all of which were found in inoculation tests to be equally susceptible to *Phytophthora infestans*, six tomato varieties, of which Giant Red, Golden Queen, and S.F. 2 were found to be susceptible to *Cladosporium fulvum* [see above, p. 481] while Stirling Castle and Manicrop and S.F. 3 were resistant, and other Solanaceous plants, including the currant tomato (*Lycopersicum pimpinellifolium*) which was immune from *C. fulvum* but susceptible, as detached leaves only, to *P. infestans*.

About 50 grafts were made and inoculated with one of the two fungi, in most cases after new growth had developed from stock and scion, controls being provided throughout, and in every instance both stock and scion retained their characteristic reaction to infection unaltered. This result indicates that resistance and susceptibility are either genotypic properties of the protoplasm or are due to some factor not transmissible as such from stock to scion or vice versa. There was no evidence to support Schmidt's view that immunity depends on an anti-germination principle—'prohibitin' [*R.A.M.*, xiii, p. 134; xiv, p. 475].

Morwood (R. B.). **Irish blight of Potatoes. Spraying experiments at Beenleigh.**—*Qd agric. J.*, xlv, 3, pp. 232–236, 1936.

A brief account is given of spraying and dusting experiments carried out in 1935 at Beenleigh, Queensland, for the control of late potato blight [*Phytophthora infestans*], the results of which showed that three applications of all the copper-containing sprays and dusts used (except ammoniacal copper carbonate, which caused severe leaf injury) noticeably increased the yield in marketable potato tubers, the increase being of over one ton per acre with 4–4–40 home-made Bordeaux mixture, at a total expense of 18*s.* for the spray materials. Ready-mixed Bordeaux mixtures and copper-containing dusts were also effective, but their higher cost does not warrant their recommendation for general use. In a collateral test, 2–2–40 Bordeaux mixture appeared to be practically as good as the 6–4–40 spray, indicating that thoroughness of application is more important than the actual strength of the mixture, but this result needs confirmation before the 2–2–40 mixture can be adopted in practice.

Naoumova (Mme N. A.). О прогнозе появления **Phytophthora infestans** на Картофеле. [On forecasting the appearance of *Phytophthora infestans* on the Potato].—*Pl. Prot. Leningrad, 1935*, 3, pp. 51–54, 1 fig., 1935. [English summary. Received May, 1936.]

The author states that field observations in 1933 and 1934, supported by controlled experiments, in the neighbourhood of Leningrad showed that Van Everdingen's four weather conditions requisite for the successful establishment of late blight (*Phytophthora infestans*) on the potato [*R.A.M.*, xiv, p. 715] also hold good in that region, but that the length of the incubation period of the disease is mainly dependent on the minimum, mean, and maximum temperatures prevailing on the three days (of 24 hours each) following the 'critical' day; relative atmospheric humidity, on the other hand, did not affect appreciably the length of this period. A statistical elaboration of the field and

experimental data obtained allowed Professor J. L. Pomorski to construct a 'nomogram', from which the incubation period may be ascertained corresponding to the average minimum, mean, and maximum temperatures established for the three days following infection. The accuracy of this method, the significance of which is evident, has been experimentally demonstrated for the Leningrad region, but it is subject to modification for other geographical regions, in dependence on the local meteorological and ecological factors.

STONE (WINONA E.). **Growth, chemical composition, and efficiency of normal and mosaic Potato plants in the field.**—*J. agric. Res.*, lii, 4, pp. 295–309, 1936.

The results [which are tabulated] of studies at Vermont Agricultural Experiment Station during the summer showed that mosaic potato plants (Green Mountain) tended to produce more leaves than the normal, but that the total leaf surface was less, owing to the smaller size of their leaves. The disease slowed down the growth of the plants in height, and of the leaflets, which soon reached the limit of increase in area, so that eventually all the leaves on the diseased plants were fairly uniform in size. Green weight per unit area of the leaves was inversely proportional to the degree of severity of the disease, but dry weight in mosaic plants per unit area was greater than in the normal plant. Ash content was lower in normal than in mosaic plants, but taken in proportion to the dry weight of the roots of normal and diseased plants, it only indicated a slight reduction of the absorbing capacity of the roots by mosaic. The carbon percentage of the dry weight varied little in the normal and diseased plants. The whole work is interpreted to demonstrate that the carbon-fixing apparatus does not function so efficiently in the mosaic as in the normal plants.

MIÈGE (E.). **Influence néfaste de la culture ininterrompue de la Pomme de terre en plaine au Maroc (1934–1935).** [The disastrous influence of the uninterrupted cultivation of the Potato in the plains of Morocco (1934–1935).]—*C.R. Acad. Sci., Paris*, ccii, 8, pp. 681–683, 1936.

Details are given of experiments in the cultivation of Fluke and Industrie potatoes in the plains of Morocco in 1934–5, which confirmed previous observations as to the impracticability of procuring adequate yields of healthy material without constant replenishment of the stock from high altitudes [*R.A.M.*, xv, pp. 171, 255, 310]. By the fourth generation in the plains the length of the growing period is extended, anomalous or pathological conditions develop in the aerial and root systems, and the yield is progressively and significantly diminished.

BOUGET (J.). **Distribution des pucerons sur les hauts reliefs et les fonds des vallées pyrénéennes (région de l'Adour).** [The distribution of aphids on the heights and in the low-lying regions of Pyrenean valleys (Adour district).]—*C.R. Acad. Sci., Paris*, ccii, 4, pp. 341–343, 1936.

In a very sheltered field at an altitude of 1,400 m. in the Pyrenees, six Triumph potato plants yielded 72 tubers with a total weight of 6 kg.

300 gm., the corresponding figures for a plot at the same elevation but exposed to the prevailing north-easterly winds being 162 (17 kg. 250 gm.). Institut de Beauvais seed from Brittany gives satisfactory yields for two to three years on the heights, whereas in the valleys production is reduced by half in the second year. The old Chardonne variety, native to the district, has been abandoned in the plains and low-lying parts of the valleys on account of its poor yields, but on the high mountain ridges it continues to produce abundant crops. These facts are attributed to the presence of aphids (stated in a supplementary note by J. Costantin to be *Typhlocyba* sp. [*R.A.M.*, viii, p. 329]) conveying degeneration viruses in sheltered sites and their absence from, or failure to propagate in, exposed localities [cf. preceding abstract].

Köhler (E.). **Untersuchungen über Synchytrium endobioticum (Schlussbericht).** [Studies on *Synchytrium endobioticum* (final report).]—*Z. PflKrankh.*, xlvi, 3–4, pp. 214–223, 3 figs., 1936.

In the first part of this paper the writer briefly describes and tabulates the cytological differences between *Synchytrium endobioticum* and *S. fulgens* [a parasite of *Oenothera lamarckiana* and *O. biennis* in Japan: *R.A.M.*, ix, p. 542], with special reference to azygote production in hanging-drop cultures [ibid., xi, p. 261]. In *S. fulgens*, according to Kusano, the female (resting) gametes assume an azygotic character unless they are immediately fertilized by a male partner, whereas in *S. endobioticum* a large excess of male gametes is available for the purpose of sexual union and consequently the development of the azygotic phase is exceptional. Under natural conditions, on the other hand, the number of azygotes in *S. endobioticum* normally exceeds that of zygotes, indicating that the mechanism of sexual alternation is influenced in some way by the host. A good medium for zygote cultivation was found to consist of 10 per cent. each of sea water and extract of manured soil, 0·3 N sodium thiocyanate, and 1 per cent. dextrose.

Lemmerzahl's method of artificial inoculation of potatoes with *S. endobioticum* [ibid., x, p. 335] consists in encircling the eyes with a strip of vaseline on which drops of distilled water are introduced through a pipette; superimposed on the water is a portion of a fresh, actively infective wart excrescence. The substitution for distilled water of solutions of potassium nitrate, sodium nitrate (each at 1·25 per cent.), or ammonium nitrate (2·5 per cent.) prevented the germination of the zoospores, and even at lower concentrations there was a marked reduction in the incidence of infection. In nature, therefore, the chemical composition of the soil will probably be the decisive factor in the development of the disease.

Inoculation experiments were carried out on a number of Solanaceae other than potato and positive results (gauged by the presence of mature or ripening sori) were obtained on *Schizanthus pinnatus*, *Solanum dulcamara*, tomato (Lucullus and Tuckswood varieties), *S. nigrum* vars. *macrocarpum* and *chlorocarpum*, *S. miniatum* and its vars. *viridicaule* and *rubricaule*, and *S. racemigerum*. In no case were the 'subinfections' characteristic of resistant potato varieties [ibid., xi, p. 69] observed, but in general the reaction of the test plants was considerably weaker than that of susceptible potatoes. In tomato, however, there was an occa-

sional formation of 'radial galls', while pubescence in the inoculated area was actively promoted, so that the epidermal cell infected by the sorus was surrounded by a peculiar crown of hair. In *S. miniatum* conspicuous epidermal swellings ('pearl galls') resulted from zygote (resting sporangial) infection, while in the same process *S. dulcamara* induced the formation of hemispherical protuberances on the stem surface.

Powell Jones (A.) & Moore (H. I.). **Cracking of Potato tubers.**—*Gdnrs' Chron.*, xcviii, 2256, pp. 445–446, 2 figs., 1935; xcix, 2569, p. 185, 1 fig., 1936.

Red King potato tubers in Yorkshire were found after harvesting in 1935 to show extensive cracking, the fissures frequently radiating from a common centre while occasionally a single furrow girdled the tuber [cf. *R.A.M.*, xi, p. 668]. The phenomenon, which appears to be associated with the excessive turgidity arising from a wet spell following a very dry growing season, was experimentally shown in preliminary tests on King Edwards to be increased by the sulphuric acid treatment for killing the tops against blight [*Phytophthora infestans*: ibid., xv, p. 45] when the tubers were dug immediately but not when lifting was delayed. The cracked tubers suffered from a severe form of fungal wet rot in storage, causing up to 15 per cent. loss.

Peppin (S. G.) & Hurst (R. R.). **Date of digging and its relation to the development of Rhizoctonia on Potato tubers.**—*Amer. Potato J.*, xiii, 3, pp. 74–76, 1936.

Experiments have been carried on at Charlottetown, Prince Edward Island, Canada, since 1924 to determine the connexion between date of lifting (from 1st September to 13th October) and the incidence of *Rhizoctonia* [*Corticium solani*] on Irish Cobbler (and in 1926 and 1935 also Green Mountain) potato tubers [*R.A.M.*, ii, p. 386]. The results to date show a steady and appreciable increase in the number of diseased tubers from week to week, the average amount of infection on Irish Cobblers being 2·33 per cent. on 1st September and 43·07 per cent. on 13th October, while the corresponding figures for Green Mountains are 0·2 and 39·55 per cent., respectively. The normal local digging date for Cobblers is about 20th September and for Green Mountains 1st October, and it is obvious from the results of these tests that harvesting should be expedited by one or more weeks according to the season.

Johnson (L. R.). **Trials of mercuric chloride for the prevention of Potato sickness.**—*Ann. appl. Biol.*, xxiii, 1, pp. 153–163, 1936.

In trials conducted over a four-year period to investigate the effect on potato sickness [*R.A.M.*, xi, p. 323] of mercuric chloride soil dressings it was found that, apart from the effect on the eelworm *Heterodera schachtii*, the tubers from plots receiving 1 gall. per sq. yd. of 1 in 250, 1 in 500, and 1 in 1,000 solutions were free from sclerotia of *Corticium solani* [commonly associated with the disease] and almost free from common scab [*Actinomyces scabies*], though these were abundantly present on the tubers from the untreated control plots. Treatment of the soil with mercuric chloride in powder form applied at the rates of 0·64 and 0·8 oz. per sq. yd. controlled collar rot and gave tubers free

from the fungus and from common scab. The mercuric chloride had a depressing effect on the early growth of the potatoes, but this effect is prevented by applying it 3 or 4 months before planting.

HÜLSEN. **Die Schwarzfleckigkeit (Blaukochen) bei Kartoffeln.** [Black spotting (blue cooking) in Potatoes.]—*Ernähr. Pfl.*, xxxii, 3, p. 55, 1 graph, 1936.

The writer briefly reports on some experiments conducted by L. Cools in Holland in 1934 to determine the relation of nutritional factors to the black spotting of potatoes and their blue discoloration on cooking [associated with melanin formation: *R.A.M.*, xii, p. 531]. Analyses by J. G. Maschhaupt showed that the potassium oxide content of the diseased tubers was extremely low in comparison with that of healthy ones, and the application of 600 kg. per hect. of 40 per cent. potash salts was necessary to bring it up to the requisite level and so prevent a recurrence of the trouble. Where potash was omitted from the fertilizing scheme the incidence of black spotting amounted to 75 per cent.

WAKSMAN (S. A.). **Humus: origin, chemical composition, and importance in nature.**—xi+494 pp., 45 graphs, London, Baillière, Tindall, & Cox, 1936. Price 30*s*.

The author in his foreword describes this treatise as an 'attempt to tell the story of humus, its origin . . ., its chemical composition, its physical properties, its importance in nature . . ., and finally its decomposition', particular stress being laid on the close connexion between humus and micro-organisms and on the part of the latter in its formation and transformation [cf. *R.A.M.*, xv, p. 51]. The very comprehensive and thoroughly documented work is divided into three parts: (A) historical development of our knowledge of the chemical nature of humus, its formation, and its role in plant nutrition; (B) origin and nature of humus; (C) decomposition of humus, its functions and applications. Scattered allusions to various points of mycological interest [ibid., x, p. 357; xiii, p. 117, *et passim*] are to be found in the last section of the work.

KARNICKA (HALINA) & ZIEMIĘCKA (JADWIGA). **Cellulose decomposition in acid soils.**—*Trans. third int. Congr. Soil Sci.*, iii, pp. 109–110, 1935.

In their study (details of which are reserved for future publication elsewhere) of the nature and activity of the micro-organisms concerned in cellulose decomposition [*R.A.M.*, xv, p. 174] in acid podsolized soils in Poland, the writers found that, at a P_H higher than 6·5, bacteria were almost exclusively occupied in this process, but at 6 to 6·5 moulds and certain actinomycetes also took part. Moulds were the principal agents of cellulose destruction in soils with a low humus content and a P_H less than 6. Applications of lime to the soil generally caused a diminution of fungal activity which was stimulated, on the other hand, by manuring with nitrogen. Thirteen species (including four of *Chaetomium*) [cf. ibid., xiii, p. 256; xiv, p. 237] were isolated from acid soils and only one (*Trichoderma lignorum*) [ibid., xv, p. 395] from a base-saturated, neutral soil. The Rossi-Cholodny technique [ibid., xv, p. 334] revealed the

occurrence of the following cycle in acid soils: cellulose is first attacked by fungi, followed by actinomycetes, and ultimately by bacteria which feed on the decaying hyphae or their products. In neutral soils, on the other hand, the attack is opened by bacteria and followed by the other groups.

CHOLODNY (N. G.). Исследование микрофлоры почвы путем проращивания почвенной пыли. [Investigation of soil microflora by means of soil dust germination.]—*Микробиол.* [*Microbiol.*], v, 2, pp. 159–166, 1 pl., 1936. [English summary.]

A new method is described for the examination of soil microflora in the live state [see preceding abstract]. A small quantity of dry soil dust, sifted through a metal sieve of very fine mesh, is evenly distributed over the surface of the centre of a cover slip, which is then placed (dusty side downwards) over the depression, containing a drop of distilled water, in a paraffined object slide. After several days in the thermostat at 23° to 24° C., the micro-organisms present in the dust begin to 'germinate', and form dense growths round the soil particles adhering to the glass, the cells being frequently arranged in the shape of a radial network of colonies at a fixed distance apart, the extent of which appears to depend on the amount of slime produced by the organisms. The exclusion of *Corynebacterium* from the soil population may be effected by the omission of paraffin from the slide. This method appears to be applicable to the detailed study of the autochthonous microflora of different soils for purposes of agricultural diagnosis, and experiments in this direction are in progress.

VERGOVSKY (V. I.). Ржавчина Мяты и способы борьбы с ней. [Peppermint rust and measures for its control.]—*Bull. méd. tech. Pl., Simferopol*, iii, pp. 5–54, 9 figs., 3 graphs, 1935. [English summary. Received April, 1936.]

This is a fully tabulated account of the author's studies from 1927 to 1932 on the rust (*Puccinia menthae*) [*R.A.M.*, xiv, p. 791] attacking peppermint (*Mentha piperita*) in the Ukraine, where it is stated to be widespread and annually to cause losses of 20 to 30 per cent. of the crop, and of as much as 50 per cent. in heavy rust years. It was shown that a moderate attack on the leaves results in lowering the yield in essential oil by 16 to 25 per cent., and that the oil obtained from diseased leaves contains less menthol (by 9 per cent. in one test) than that from sound leaves. In soils with low moisture content the rust may kill a large number of young peppermint shoots, while in sufficiently watered soil it causes hypertrophy of the stem tissues with no wilt.

In artificial infection experiments it was shown that only teleutospores that overwintered under natural conditions were capable of infecting the host. These spores are usually very abundant in the soil in peppermint-growing regions, but they can only attack the young plants before or just after their emergence from the soil, later growth being immune from infection. Adult leaves, on the other hand, are readily infected by the aecidio- and uredospores of the fungus. No evidence was forthcoming in confirmation of the view that the rust

overwinters in the form of mycelium in the roots of diseased peppermint plants, and spring renewal of the disease was found to be solely due to infection of the plants by the teleutospores in the soil. It was further shown that infection is not systemic, and that every new infection of the leaves is caused by inoculum from the air. Under controlled conditions the uredospores of *P. menthae* germinated best at temperatures between 15° and 20° C., but not at all below 10° or above 25°. In hot summer weather the development of the uredo stage is effectively controlled by the heavy development on it of *Darluca filum* [see above, p. 488].

Varietal resistance tests showed that the seven species of *Mentha* and nine seedling lines of *M. piperita* which were studied varied from immune to highly susceptible to the rust, and that uredospores collected on a given species or form exhibit a high degree of specialization to this host, but may, under especially favourable conditions, also attack other species of the genus. Pubescence of the stems and leaves appeared to be correlated with resistance in peppermint. While some of the hybrids studied showed immunity from, or high resistance to, the rust, and yielded an essential oil favourably comparing with that from the true peppermint, no clones of *M. piperita* were found combining resistance with commercial properties.

Applications of Bordeaux mixture against the rust do not yield satisfactory results, and the best method of control is by deep ploughing in (not less than 5 cm. deep) of the peppermint stubble early in the autumn, and by keeping the fallow clean throughout the winter and next spring. Root cuttings planted out in the field should be set at a depth of not less than 5 cm., sufficient to prevent the germination of the teleutospores that may be present on them. In years of heavy rust epidemics the peppermint should be harvested before the appearance of the teleutospores, i.e., before the onset of cooler autumn weather.

STOREY (H. H.). **Virus diseases of East African plants. IV. A survey of the viruses attacking the Gramineae.**—*E. Afr. agric. J.*, i, 4, pp. 333–337, 9 figs., 1936.

Continuing his studies on virus diseases [*R.A.M.*, xv, p. 277] the author briefly surveys the viruses attacking Gramineae in East Africa, arranging them under the headings (1) common sugar-cane mosaic group, (2) Agaul mosaic, (3) streak group, (4) R.P. 8 group, (5) maize stripe, and (6) a new mosaic-like maize disease. The following points may be noted. Evidence is adduced indicating the existence of strains of the sugar-cane mosaic virus differing from the one commonly found [ibid., xiv, p. 123; xv, p. 319].

The Agaul sugar-cane variety in South and East Africa is affected by a mosaic disease, the virus of which was not transmitted by needle inoculations or *Aphis maidis*; further, there was no evidence that spread to other sugar-cane varieties had occurred. This virus is therefore tentatively separated from the first group.

The available evidence indicates that each host or group of hosts affected by streak carries a specialized strain of the virus [ibid., xi, p. 66], and recently another strain apparently specialized to maize has been recognized by A. P. D. McClean.

A streak disease of R.P. 8 sugar-cane was reported by Shepherd in 1929 [ibid., viii, p. 89] and a plant of this variety intercepted in quarantine in East Africa showed typical streak symptoms. Repeated attempts to transmit the virus to maize and healthy R.P. 8 and other sugar-cane varieties by means of *Cicadulina* spp. and *Peregrinus maidis* all failed, and the virus is accordingly regarded as distinct from the common streak.

A maize disease referred to as 'stripe', hitherto recognized in Africa only in the Amani district, so closely resembles streak [ibid., xv, p. 203] in its symptoms as often to be indistinguishable from it. Yellow stripes are formed along the veins, tending to be longer than those due to streak. Sometimes they are rather wide and separated by considerable areas of green tissue, while at other times they are narrow but so crowded that large areas of leaf become almost entirely yellow. The differential character is transmission by *P. maidis* [cf. ibid., vi, p. 438; vii, p. 159; xii, p. 756] and not by *Cicadulina*. The virus is not known to be transferable in East Africa to any other host. It is perhaps identical with that recorded by Kunkel and may possibly prove to be the same as R.P. 8 streak.

A new mosaic-like disease was produced in the greenhouse on maize seedlings exposed to the feeding of *Cicadulina* collected on maize near Amani. Newly unfolded leaves of recently infected plants show a diffuse blotching, which disappears as the leaf ages; in its later growth an affected plant may show no markings even on the youngest leaves. Owing to the transitory nature of the symptoms the disease has not yet been diagnosed with certainty in the field. The evidence obtained showed that it is due to a virus transmitted by the same species of *Cicadulina* as transmit streak [*C. mbila* and *C. zeae*: ibid., xiii, p. 571]. As the symptoms of the two diseases are so dissimilar it is, however, unlikely that the virus is merely an unusual strain of the streak virus. Unlike the other diseases mentioned in this paper it appears to have little effect on yield.

UNAMUNO (L. M.) **Algunas novedades micológicas de la flora española.** [Some mycological novelties of the Spanish flora.]—Reprinted from *XIV Congr. Asoc. esp. Progr. Cienc., 1934*, 21 pp., 6 figs., 1935. [Received June, 1936.]

Continuing his geographical and taxonomic studies on the Spanish mycoflora [*R.A.M.*, xv, p. 175], the writer gives an annotated list of fifty species, three of which are new and are furnished with Latin diagnoses. *Uromyces fabae* [ibid., xiv, p. 141] was collected in three new localities on cultivated vetch and broad beans, the latter crop being totally destroyed at Portichol, Alicante, in 1933. *Crataegus* leaves in Alicante were found to be infected by *Gymnosporangium clavariaeforme* [ibid., xiv, p. 533]. *Melampsora allii-populina* [ibid., x, p. 418] occurred on poplar (*Populus pyramidalis*) foliage in Santander. Barley grain in Badajoz was invaded by *Acremonium hordei* n.sp. characterized by simple, hyaline, usually curved conidiophores, 21·5 to 37·2 by 2 to 3 μ, bearing hyaline, ellipsoid to elongated, straight or curved conidia, rounded at both ends, 4 to 6 by 2·3 μ.

VIENNOT-BOURGIN (G.). **Contribution à l'étude de la flore cryptogamique du Valais (Suisse).** [A contribution to the study of the cryptogamic flora of Valais (Switzerland).]—*Rev. Path. vég.*, xxiii, 1, pp. 33–77, 5 pl., 8 figs., 1936.

This annotated list comprises 93 fungi (chiefly rusts and smuts) found in a valley in Valais, Switzerland [cf. *R.A.M.*, xiv, p. 645].

FRASER (LILIAN). **An investigation of the sooty moulds of New South Wales. III. The life histories and systematic positions of Aithaloderma and Capnodium, together with descriptions of new species. IV. The species of the Eucapnodieae. V. The species of the Chaetothyriae.**—*Proc. Linn. Soc. N.S.W.*, lx, 1–2, pp. 97–118; 3–4, pp. 159–178, 280–290, 195 figs., 1935.

Continuing her studies on the sooty moulds of New South Wales [*R.A.M.*, xiv, p. 60], the writer describes in part III of this paper her examination of the life-histories of four fungi, viz., *Capnodium salicinum*, *C. salicinum* var. *uniseptatum* n. var. on *Spartium* sp., *Aithaloderma viridis* n. sp. on *Elaeodendron australe*, and *A. ferruginea* n. sp. on *Citrus* sp., the new species and variety being furnished with Latin and English diagnoses. The author does not accept the transference of species of *Capnodium* to the later genus *Teichospora* [cf. ibid., xv, p. 25] nor does she consider Woronichin's order Capnodiales justified since these fungi show no feature which should exclude them from the Dothideales as defined by Miller.

In part IV further observations are made on *C. salicinum* and its var. *uniseptatum*, emended descriptions are given of the imperfectly known species, *C. walteri* [ibid., xiii, p. 187], *C. fuliginodes*, *C. anonae*, *C. mucronatum*, and *C. australe* [loc. cit.], and Latin and English diagnoses are provided for the following new species: *C. moniliforme*, *C. elegans*, *Henningsomyces affine*, *Limacinia concinna* and varieties, *C. fuliginodes* var. *grandisporum*, and *C. anonae* var. *obscurum*. *Scorias philippinensis*, recorded from the Philippines in 1932 [ibid., xi, p. 547], is reported for the first time from Australia. Three unidentified species of *Microxyphium* [ibid., xi, p. 404; xiii, p. 187] and two of *Caldariomyces*, the exact position of which is still obscure, are also described. The taxonomy of the sooty moulds herein recorded is discussed and observations are made on five common types of pycnidial fructification.

Part V deals with eight new species of the Chaetothyriae, viz., *Chaetothyrium fusisporum* (one of the hosts of which is *Acacia binervata*), *C. globosum*, *C. griseolum*, *C. peltatum*, *C. fuscum*, *C. strigosum*, *C. cinereum*, and *C. depressum* (on *Sideroxylon australe*), discusses the affinities of *C. loganiense*, records the detection of *C. roseosporum* (on *S. australe* and other hosts) for the first time in Australia, and gives supplementary notes on *A. ferruginea* and *A. viridis*.

HONEY (E. E.). **North American species of Monilinia. I. Occurrence, grouping, and life-histories.**—*Amer. J. Bot.*, xxiii, 2, pp. 100–106, 4 diags., 1936.

This paper is stated by the author to be introductory to a series of studies of the North American species of parasitic fungi referable to his

genus *Monilinia* [*R.A.M.*, xv, p. 744]. He now suggests that the genus be divided into two sections, namely (I) the Junctoriae or Eumoniliniae, to include species that do not produce disjunctors between their macroconidia, and (II) the Disjunctoriae, to comprise those that produce these organs, which are described and illustrated diagrammatically. The two groups are also separable by the intensity of the specific aromatic odour developed by them, their host specialization, and their life-histories, which are represented diagrammatically. The most widely known representatives of the first group are *M.* [*Sclerotinia*] *fructicola*, *M.* [*S.*] *fructigena*, *M.* [*S.*] *laxa*, and probably *Phaeosclerotinia nipponica* [? *Lambertella corni-maris*: ibid., xiv, p. 774]. The second group contains the majority of the known species of *Monilinia*, including 12 species (3 new [without diagnoses] and 8 new combinations) reported from North America, and a number of species recorded under *Sclerotinia* from Europe and the Orient. *S. padi* is renamed *M. padi*.

Ghimpu (V.). **Afecțiunile patologice și inamicii Tutunului din România în 1935.** [Pathological disturbances and pests of Tobacco in Rumania in 1935.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 4, pp. 410–418, 1935. [Received June, 1936.]

Notes are given on the virus, fungal, and bacterial diseases and insect pests affecting the Rumanian tobacco crop in 1935 [cf. *R.A.M.*, xii, p. 791], including ring spot (tobacco virus 10), mosaic (tobacco virus 1), spot necrosis (potato viruses 16 and 20), and aucuba mosaic (tobacco virus 6A), *Asterocystis radicis* [cf. ibid., vii, p. 202; xv, p. 323] causing damage in the seed-bed, and *Fusarium equiseti*, *F. scirpi*, and *Nigrospora oryzae* producing leaf spots.

Best (R. J.). **Precipitation of the Tobacco mosaic virus complex at its isoelectric point.**—*Aust. J. exp. Biol. med. Sci.*, xiv, 1, pp. 1–13, 2 graphs, 1936.

The virus of ordinary tobacco mosaic (tobacco virus 1) from artificially infected Blue Pryor plants is precipitated from the clarified juice by adjusting the P_H value to between 3 and 4, with a maximum at 3·4, at which point, under suitable conditions, more than 99 per cent. of the virus may be precipitated [*R.A.M.*, xv, p. 404]. The precipitate constitutes about 0·3 per cent. of the clarified juice or 3 per cent. of the total solids of the crude juice, the average yield being 2 mg. per ml. of juice.

Relatively stable colloidal solutions of the precipitate are obtained by elution with buffer solutions of phthalate-phosphate-borate at varying hydrogen-ion concentrations between P_H 2·8 and 2·3 or between 4·5 and 7·5, the resultant solutions containing the whole of the precipitated virus. It is not possible by selective elution to separate the virus from the precipitate either on the acid or alkaline side of its isoelectric point. It is concluded from the evidence as a whole that the precipitate represents either the virus itself or a complex of virus with some fundamentally related substance present in the juice.

Precipitation of the virus from suspensions of the 'isoelectric' precipitate in a buffer solution of P_H 7 takes place in the same way as from the juice, with a maximum at 3·4. The juice of Dwarf Champion tomato

plants artificially infected by the tobacco mosaic virus behaves similarly, and maximum precipitation occurs at the same P_H value. The isoelectric point of the virus-complex may thus be taken as P_H $3{\cdot}4 \pm 0{\cdot}1$. The precipitate reacted positively to protein tests, and desiccator-dried samples contained 14 per cent. nitrogen.

AINSWORTH (G. C.) & SELMAN (I. W.). **Some effects of Tobacco mosaic virus on the growth of seedling Tomato plants.**—*Ann. appl. Biol.*, xxiii, 1, pp. 89–98, 5 graphs, 1936.

In this study parallel series of healthy tomato seedlings and others inoculated with tobacco mosaic virus 1 [see preceding abstract] were grown at different times throughout a complete year, and the growth rate measured by determining the dry weights of the plants at convenient intervals. The results [which are tabulated] showed that there was a high negative correlation between growth rate and incubation period. The evidence also indicated that the relative effect of the virus on growth rate is the same in winter and summer in spite of seasonal differences in the rate of growth and the symptoms produced. One effect of the virus is to delay the hydrolysis of starch in the leaves, and this metabolic disturbance may account for the reduction in growth. The accumulation of insoluble products in the leaf would tend to depress assimilation and this slower hydrolysis to reduce the amount of material translocated [*R.A.M.*, xiii, p. 476]. The percentage water content of all parts of the plants infected with tobacco virus 1 was lower than that of the controls during the early stage of the disease, but tended to be higher later on.

HOGGAN (I[SMÉ]A.) & JOHNSON (J.). **Behavior of the ordinary Tobacco mosaic in the soil.**—*J. agric. Res.*, lii, 4, pp. 271–294, 1936.

After stating that preliminary tests showed that the virus of ordinary tobacco mosaic (tobacco virus 1) [see preceding abstracts] is readily leached from decaying infected plant tissues into the soil, where it is known to survive the winter [*R.A.M.*, ix, p. 207; xiii, p. 729], the authors give a tabulated account of greenhouse and laboratory experiments on the behaviour of the virus (added either as extract from infected plants or in finely divided tissues) in 27 representative samples of tobacco soils of the United States. An appreciable amount of virus contained in the extract was immediately inactivated after addition to certain soils, but in no case was the inactivation nearly as high as that caused by charcoal or other highly adsorptive substances. In moist soils no correlation could be established between the degree of inactivation and the physical character of the soil, but the virus was immediately, and usually completely, inactivated when the soil was desiccated, the rate and degree of inactivation during drying being to a considerable extent correlated with the physical properties of the soil. The degree of water saturation of the soil above a low minimum, and hydrogen-ion concentrations within the range that occurs naturally in the field, did not appear to affect the inactivation of the virus. Aeration, on the other hand, relatively slowly increased the rate of inactivation. While the rate of the process was not appreciably affected by soil temperatures between 5°

and 30° C., it was definitely greater at 40°. Freezing rapidly inactivated the virus in the soil, presumably because of the freezing out of the soil moisture. Virus present in undecayed plant tissue was not appreciably inactivated either by desiccation or freezing, but desiccation of severely decayed tissue resulted in rapid inactivation of the remaining virus in it. In decaying moist plant tissues inactivation of the virus was gradual, considerable amounts of the virus remaining in the tissues until final disintegration. The rate of inactivation was definitely more rapid in certain soils than in others, and strikingly more rapid in pure sand than in field soils, for some reason which is not yet understood.

JENSEN (J. H.). **Studies on the origin of yellow-mosaic viruses.**—*Phytopathology*, xxvi, 3, pp. 266–277, 1 fig., 1936.

Further evidence was experimentally obtained that the yellow mosaic viruses originate in tobacco plants infected by tobacco mosaic (tobacco virus 1) [*R.A.M.*, xiii, p. 329; xv, p. 321], procured in these tests from a necrotic lesion on a leaf of *Nicotiana langsdorffii*. The attempts made to secure single infectious units of virus, by means of high-dilution single pin-puncture inoculations, ultrafiltration, and chemical treatments were apparently largely successful, since tobacco plants inoculated with the material so derived developed bright yellow spots from which yellow mosaic viruses were isolated. Many, if not all, of the 51 strains isolated from the diseased plants were judged, on the basis of variations in the symptoms induced, rates of movement, virulence, and other features, to be distinct, and there are marked indications that new strains of the tobacco mosaic virus arise suddenly in infected plants by some process akin to mutation. That the yellow mosaic viruses represent strains of the tobacco mosaic virus proper has been demonstrated by the peculiarity to both groups of certain characters, host reactions, and serological relationships [cf. ibid., xiv, p. 798].

THUNG (T. H.). **Infective principle and plant cell in some virus diseases of the Tobacco plant II.**—*Handel. 7de ned.-ind. natuurw. Congr.* [*1935*], pp. 496–507, 1 pl., 1936.

A tabulated account is given of the writer's continued studies on the virus diseases of tobacco in Java [*R.A.M.*, xi, p. 750], the experiments herein described being concerned with the immunizing effects of ordinary tobacco mosaic (A), mild mosaic (B), white mosaic (C), ring spot necrosis (D), yellow bleaching tobacco ring mosaic (E), severe mosaic (F), distorting mosaic 1 (G), speckled mosaic (H), Holmes's masked strain of tobacco mosaic (I), streak [see next abstract] (J), and Holmes's distorting strain [ibid., xiv, p. 61] (K).

In presenting the results an attempt has been made to express the different leaf symptoms in formulae composed of capital letters and figures, e.g., an ordinary mosaic leaf is represented by $A_1A_2A_3A_4$, 1 meaning leaf form, 2 mosaic pattern, 3 the predominating, and 4 the second colour. To express a mixed pattern in which either of the component viruses is to be reisolated the + sign is used, e.g., $\frac{1}{2}A_1A_2A_3A_4 + \frac{1}{2}C_2C_3C_4$ for a leaf affected by ordinary mosaic combined with white. The fraction implies the portion of the lamina estimated to be occupied

by the pattern in question. The predominating virus in a mixture is placed first in the formula. In cases of mixtures of two viruses in which only one of the components is to be reisolated, the × sign is used, e.g., $G_1G_2 \times C_3C_4$, meaning that the leaf form and pattern are of the distorting mosaic type 1 (G) and the typical colour white (C), the former predominating and the latter to be reisolated. Various other conventions are indicated.

The capacity of the different viruses for penetration into already diseased plants and the resistance of the latter to reinvasion were found to vary greatly. Of the viruses not inoculable by *Myzus persicae*, ordinary and white mosaic are the strongest both in infective capacity and resistance, a correlation between these two characters being apparently established. More powerful still are the speckled mosaic and streak viruses, both transmissible by *M. persicae*, which are able to invade even ordinary mosaic. The speckled mosaic in such cases is invisible, but its presence is demonstrable by means of the aphid. When a plant with distorting mosaic is invaded by the white virus, the leaves formed after the second inoculation assume the shape and pattern of the distorting mosaic, but the dominant colour is white. An inoculation with the juice of this mixture produces only white mosaic, but an inoculation of the distorting mosaic at least 24 hours before infection by the white obviates the suppression of the former by the latter. Although speckled mosaic is dominated by distorting in the visible leaf symptoms, the inoculation of a mixture of both juices results in domination of the distorting only on some 20 per cent. of the plants. In general, the inoculability of the latter virus is comparatively low, infection frequently occurring only on 70 or 80 per cent. of the inoculated plants after an unusually lengthy incubation period.

Immunizing characters are useful in the differentiation of certain viruses, e.g., ordinary tobacco mosaic, Holmes's distorting strain, and the writer's distorting mosaic 1. The patterns of the two first-named are similar and the distorting effects of the second are practically absent in Java, but the immunizing characters are different. Thus, ordinary mosaic gives complete immunization against white mosaic three to four days after inoculation and is not dominated by streak. Holmes's distorting mosaic takes much longer—up to ten days—to confer immunity from white mosaic and is entirely dominated by streak. The writer's distorting mosaic affords no immunity at all.

A retardation in the development of the symptoms of white mosaic, particularly the more pronounced, was observed on plants already inoculated with other viruses, amounting to 1 to 3, 5, 5, 7, and 9 days, respectively, for distorting and speckled mosaics, Holmes's masked strain, severe mosaic, and ring spot.

Most of the viruses used in these tests confer no immunity from white mosaic or ring spot, but after a second inoculation with ordinary mosaic plants affected, e.g., by severe or distorting mosaic, will not contract other viruses on a third inoculation, since the ordinary mosaic becomes systemic in such plants and presumably the plant cell infected by different viruses retains the immunizing properties of each. Plants with a combination of either severe or distorting mosaic, and ring spot are not susceptible to white mosaic, immunity from which, however, is not

conferred by any of the three separately. It would thus appear that the several immunizing effects of these virus combinations are cumulative.

In mixed infections of severe and white mosaic attempts to inoculate the parts affected only by severe mosaic with ring spot gave negative results, a fact attributed by the writer to a blocking element developed under the influence of the white mosaic and found in other cells of the leaf besides those infected with the virus in question. Patterns of the latter disease on plants previously inoculated with ordinary mosaic are more or less prominent according to the length of time elapsing between the inoculation with ordinary mosaic and the introduction of the white virus, no symptoms of the latter developing after a delay in inoculating of four days.

On the basis of the foregoing experiments the writer briefly develops the following hypothesis: each of the inoculated viruses induces in the tobacco plant the formation of a non-infectious averting principle or immunizing substance against other viruses. The sap-transmissible group of viruses appears to produce one kind of averting principle and the aphid-transmissible group another sort.

JOHNSON (J.). **Tobacco streak, a virus disease.**—*Phytopathology*, xxvi, 3, pp. 285–291, 3 figs., 1936.

Tobacco streak [*R.A.M.*, xiii, p. 61] is stated to be a relatively uncommon disease which was long thought to be of non-parasitic origin but has now been shown by the writer's experiments in Wisconsin to be caused by a virus.

Under field conditions the symptoms are most prominent on the basal part of the middle leaves, which show irregular markings in the shape of spots, lines, or circles, with or without uniform patterns. The affected foliage may be considerably dwarfed and ragged, but is rarely or never entirely destroyed or shed in the field. The plants tend to recover to the extent that the upper leaves may show no symptoms whatever. In the greenhouse the leaves on young inoculated plants may almost succumb but eventually regain turgidity. Vein-clearing, followed by water-soaked systemic necrosis, may develop on new leaves three days after inoculation. Recovered plants on reinoculation show only vein-clearing and mild mottling, these slight reactions apparently indicating the acquisition of resistance to the more severe forms of the disease.

The virus collected from five fields in September, 1934, was readily transmitted to young greenhouse plants by the rubbing method of inoculation, but negative results have so far been obtained in experiments with insects, although the localization of infection near the borders suggests the implication of the latter in the spread of streak. The disease does not appear to be seed-borne. It was successfully conveyed in greenhouse trials to *Nicotiana rustica*, *N. glutinosa*, *N. tabacum* × *N. glutinosa* hybrid, *Datura stramonium*, *Nicandra physaloides*, and *Physalis pubescens*; tomato, potato, eggplant, and pepper (*Capsicum annuum*) were not attacked. The virus is inactivated by ageing for 24 to 36 hours at 22° C., its thermal death point is 53° (ten minutes' exposure), and probably does not survive a dilution beyond 1 in 30. It is clear, therefore, that the streak virus is very sensitive to external

conditions and is not likely to be perpetuated to any extent from year to year in the absence of vegetative propagation of its host.

Of the several virus diseases of tobacco recorded in recent years 'vein streak' [ibid., ix, p. 615] of Sumatra approximates most closely to the one here described, but other diseases not very definitely distinguishable from it on the evidence at present available include Rotterdam B disease [ibid., xv, p. 403], curl [ibid., xv, p. 118], stripe and curl [ibid., x, p. 562], and tobacco etch [ibid., xiv, p. 685].

SATTLER (F.). **Zur Biologie von Thielavia basicola (B. et Br.) Zopf.** [On the biology of *Thielavia basicola* (B. & Br.) Zopf.]—*Phytopath. Z.*, ix, 1, pp. 1–52, 15 figs., 1936.

Experiments were carried out in 1932–3 under controlled conditions at the Bonn-Poppelsdorf Agricultural Institute to determine the influence of soil moisture, temperature, carbon dioxide content of the air, light, nutrition, mechanical weakening, and soil constitution on the infection of various hosts by *Thielavia* [*Thielaviopsis*] *basicola* [*R.A.M.*, xv, p. 263, and above, p. 467] and on the symptoms induced by the fungus.

The amount of soil moisture was found to be directly proportional to the extent of the injury caused, the virulence of the symptoms on beans (*Phaseolus vulgaris*) and tobacco increasing parallel with a rise in the moisture content from 30 to 90 per cent. Both beans and lupins (*Lupinus angustifolius*) suffered heavier damage at 20° to 23° than at 25° to 28° C., indicating that the fungus inflicts the maximum injury at or near its optimum for growth [ibid., xii, p. 513]. The symptoms of infection by *T. basicola* on beans were most severe just above the optimum concentration for the plants of atmospheric carbon dioxide, i.e., 2·5 per cent. Drastic shading promoted such virulent attacks of *T. basicola* on beans as completely to destroy the plants, while the partial withdrawal of light produced comparable but less serious effects; tobacco, on the other hand, appeared rather to benefit from the latter course, acquiring temporary resistance to infection. Excess or deficiency of nitrogen and excess of potash led to the heaviest damage by the fungus on beans, lupins suffering most severely from excess potash. All types of soil either naturally poor in organic material, or in which the latter has been destroyed by sterilization, indirectly stimulate the pathogen to increased virulence by eliminating normal competition, and in pure sand the fungus is literally forced to adopt a parasitic mode of life in the absence of any other means of nutrition. Severe root infection by *T. basicola* necessarily involves the death of the host, but in milder cases the formation of adventitious roots permits the plant to withstand the parasite.

The occurrence of physiologic specialization within *T. basicola* was demonstrated by inoculation experiments on tobacco, beans, and lupins with collections of the fungus from the United States and Germany, the first-named host reacting positively only to American strains isolated from tobacco, while the other two (except *L. albus*) were infected by the bean (*P. multiflorus*) and *Cyclamen* [ibid., ix, p. 387] strains from Germany and by that of *Primula obconica* from Holland [ibid., xiii, p. 771] but not by the tobacco collections. In saprophytic culture the pathogen

undergoes a decrease of virulence, but its aggressive properties may be restored by transference to the living plants.

CLAYTON (E. E.). **Water soaking of leaves in relation to development of the wildfire disease of Tobacco.**—*J. agric. Res.*, lii, 4, pp. 239–269, 9 figs., 1936.

The results of the investigations described at length in this paper showed that the late-season, destructive type of tobacco leaf spot associated with wildfire (*Bacterium tabacum*) [*R.A.M.*, xv, p. 179] which is prevalent in the Maryland–Pennsylvania tobacco-growing area, almost exclusively after heavy rain-storms, is primarily caused by the development in the leaves of more or less extensive water-soaked areas due to the flooding of the intercellular spaces, in which the bacteria multiply and spread with considerable rapidity. In controlled experiments it was shown that, whereas in the normal tobacco leaf the 'halo' type of lesion took about a week to develop, water soaking induced the formation of the large, destructive lesions in 48 hours, and increased the size of the usual lesions by more than 6,000 per cent. Persistence of the water-soaked areas for at least 24 hours was, however, essential for the development of this form of the disease. It was further experimentally shown that water-soaking only results under the impact of hard-driven rain or spray, especially on the lower surface of the tobacco leaves; the susceptibility of the leaves is, however, modified by many factors, this accounting for the wide differences usually observed in the damage done by the disease. Mature basal leaves became more easily water-soaked than the young top leaves on the same plant; low topping increased the susceptibility of the leaves, while high or no topping had the opposite effect; high nitrogen and low potash fertilization also rendered the leaves more liable to be water-soaked.

These results are interpreted as indicating that susceptibility or resistance of tobacco to *Bact. tabacum* is a question of water relations, and that the halo form of the disease is the response to infection of the normal leaf, while the destructive type is the response of the leaf after its natural resistance has been broken down by water-soaking.

RUSSELL (T. A.). **Diseases and pests of Tomatoes in Bermuda.**—*Trop. Agriculture, Trin.*, xiii, 3, pp. 71–78, 1 pl., 1936.

A brief account is given of the pests and fungal and bacterial diseases of the tomato which have been so far recorded in Bermuda; the diseases discussed comprise *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xv, p. 406], *Septoria lycopersici* [loc. cit.], *Cladosporium fulvum* [see above, p. 522], *Sclerotinia sclerotiorum* [ibid., xiii, p. 356], *Bacterium vesicatorium* [ibid., xv, p. 63], *Rhizoctonia* [*Corticium*] *solani* [ibid., xiv, p. 263] (which occurs chiefly if not entirely on fruit that has rested on the ground), *Phoma destructiva* [ibid., xv, p. 265] (which may be so severe that sound fruit is hardly to be obtained), *Phytophthora infestans* [ibid., xv, p. 405], leak (apparently due to *Bacillus aroideae* following insect or other injury to the fruit) [ibid., xiii, p. 194], and the non-parasitic diseases blossom-end rot [ibid., xv, p. 406], splitting of the fruit, and sunburn.

Ryakhovski (N. A.). Установление вредоносности болезней Помидор и разработка способов борьбы с ними. [Determination of the injuriousness of Tomato diseases, and elaboration of methods for their control.]—*Pl. Prot. Leningrad, 1935*, 3, pp. 88–91, 1935. [Received May, 1936.]

The author states that since 1929, when it was first recorded in the governments of Voronezh and Kursk, south Russia, tomato leaf curl [*R.A.M.*, x, p. 493] has become one of the major troubles of the crop in that region, where it frequently reduces the yield in marketable fruit by from 30 to 80 per cent. It was experimentally shown that the disease is not transmitted to healthy tomato plants by suckering, needle punctures, rubbing healthy leaves or stems with diseased juice, or by aphids; in the greenhouse, however, 27·4 per cent. infection resulted when healthy tomato seedlings were sprayed with juice extracted from diseased plants. Plants raised from seed obtained from diseased tomato plants gave 98·3 to 100 per cent. infection, while seedlings raised in neighbouring plots from healthy seed showed from 0 to 1·3 per cent. leaf curl, demonstrating that the disease is nearly always carried by the seed. Varying the dates of sowing, density of stand, crop rotation, and mulching did not affect the incidence and development of leaf curl, and the only means of control is the use of seed carefully selected from healthy tomato plants.

White leaf spot (*Septoria lycopersici*) [see preceding abstract] of tomatoes is equally widespread in both governments, where, in severe outbreaks, it accounts for as much as half of the crop. Experiments showed that it may be controlled by periodically spraying the plants with 0·5 or 1 per cent. Bordeaux mixture both before and after transplanting the seedlings from the greenhouses; other control measures recommended are strict sanitation of the greenhouses, crop rotation, weeding the tomato fields, and deep ploughing in of the fields in the autumn.

Magee (C. J.). **Spotted wilt disease of Lettuce and Potatoes.**—*Agric. Gaz. N.S.W.*, xlvii, 2, pp. 99–100, 118, 4 figs., 1936.

Spotted wilt is stated to have been more prevalent in New South Wales during the spring and early summer of 1935 than for several years past [*R.A.M.*, xv, p. 280], the destruction of the tomato crop being particularly extensive, while lettuce [ibid., xiv, p. 404] and potatoes have also suffered severely (15 to 25 per cent. infection in the former and 10 to 50 per cent. in the latter crop). In lettuce the first symptom is a general yellowing of the plant, accompanied by the appearance of brown, irregular, slightly depressed lesions on both the upper and lower surfaces of the central leaves, while the outer foliage tends to droop and to grow abnormally slowly. Later the centres of the spots collapse and assume a parchment-like consistency. These symptoms are often unilateral. In old plants a mosaic-like mottling may develop in the lower leaf axils. On potato plants the disease takes the form of numerous circular, brown, frequently zonate, necrotic areas on the upper leaves and longitudinal dead lesions on the stem apices, while in addition to these features some of the tubers show brown areas in the flesh; growth is arrested and yields reduced. Control of spotted wilt on lettuce and

tomato is likely to present considerable difficulty, but may be facilitated by regular inspections and systematic removal of diseased material.

GÖPFERT (J.). **Bekämpfung der Krautfäule bei Tomaten.** [Control of Tomato blight.]—*Obst- u. Gemüseb.*, lxxxii, 3, pp. 43–44, 1 fig., 1936.

In 1935 Standard (Original) tomato seed was dusted with ceresan and sown in the greenhouse on 4th March. The resultant seedlings were twice sprayed against late blight (*Phytophthora infestans*) [*R.A.M.*, xv, p. 324] with 1 per cent. Wacker's Bordeaux mixture and planted out on 24th May; on 8th June and 1st and 24th July the same preparation was applied to three plots of 100 sq. m. each at concentrations of 1, 1·5, and 2 per cent., respectively, while a fourth was given Wacker's copper dust and a fifth left untreated. The following yields were obtained: untreated, 462 kg. (estimated market value M. 92·40); 1, 1·5, and 2 per cent. Bordeaux, 570, 536, and 606 kg. (M. 114, 107·20, and 121·20, respectively); and dusted 550 kg. (M. 110). The 2 per cent. Bordeaux mixture gave practically complete control of the disease.

SEATON (H. L.) & GRAY (G. F.). **Histological study of tissues from greenhouse Tomatoes affected by blotchy ripening.**—*J. agric. Res.*, lii, 3, pp. 217–224, 9 pl. (1 col.), 1936.

The results of the histological studies reported in this paper support the view that the condition in greenhouse tomato fruits known as blotchy ripening [*R.A.M.*, xiii, p. 663] is primarily caused by the withdrawal of the water from the fruit during periods of excessive transpiration, occurring two to five days before the fruit ripens. This was indicated by the collapse in affected areas of the maturing ovary walls of the parenchyma cells near or adjacent to the vascular bundles. Blotchy ripening is stated to be prevalent throughout the north-central United States in the spring crop in greenhouses, but to occur rarely in the field and then only during drought periods. It is not of economic importance in the tomatoes that mature from October to January.

GRIEVE (B. J.). **Effect of inoculation of plant stems with Bacterium solanacearum.**—*Nature, Lond.*, cxxxvii, 3465, p. 536, 1936.

In an experimental study at Melbourne University of two primary reactions of tomato and other plants to invasion by *Bacterium solanacearum*, viz., petiole epinasty and adventitious root production, the former symptom was found to be confined to the lower petioles irrespective of the site of inoculation at the top or bottom of the stem. A condition for the development of epinasty appears to be the invasion of only one lateral petiolar or one lateral and the small central petiolar bundle, wilting without epinasty being the sequel to infection of all three bundles. The epinasty is permanent and is usually followed two to ten days later by wilting. The increased growth on the upper side of the petiole is believed to be generally due to the local activity of the bacteria. Petiole epinasty caused by *Bact. solanacearum* has also been observed in potato, African marigold [*Tagetes erecta*], and castor oil [*Ricinus communis*], the reaction of the first-named being particularly well-defined and rapid. Other factors besides stimulation are thought

to be involved in the formation of adventitious roots in infected tomatoes. A substance has been obtained from *Bact. solanacearum* that stimulates this process in tomato [cf. *R.A.M.*, xv, p. 81] and *T. erecta*, but evidence is accumulating to show that in the former partial blockage of the vascular system also plays an important part.

LUTZ (L.). **Sur la dégénerescence gommeuse des bois dans la nature.** [On the gummy degeneration of woods in nature.]—*Bull. Soc. mycol. Fr.*, li, 3–4, pp. 348–350, 1935.

A systematic search in widely separated parts of France for living and felled trees showing gum exudation associated with fungal parasitism gave a total of 38 fungi (including many Polypores, *Stereum purpureum*, and *Coniophora cerebella* [*C. puteana*]) on 27 tree varieties. In most cases the wood was rotting, and showed cavities either filled or soaked with water, or else the sap was rising and the tissues in consequence were saturated with water. Gumming is considered to be a general phenomenon, dependent upon the degree of saturation of the wood attacked [cf. *R.A.M.*, x, p. 700].

MÜNCH (E.). **Das Erlensterben.** [The dying-off of Alders.]—*Forstwiss. Zbl.*, lviii, 6, pp. 173–194; 7, pp. 230–248, 13 figs., 1936.

The writer describes and discusses, mainly from the silvicultural standpoint, an extensive dying-off of alders in various parts of Germany. The disease is characterized by a die-back of branches and stems, generally proceeding from the crown, and sometimes even from the twigs; it begins to be noticeable at the age of about twelve years and continues until the death of the trees some eight years later. It is preceded by an altogether exceptional precocity and fertility, with a tendency to unshapely development of the stem and crown. *Valsa oxystoma* and other wood- and bark-inhabiting fungi were constantly associated with the trouble, but negative results were given by inoculation experiments with the first-named, the rôle of which in the etiology of the die-back remains for the present obscure. It is thought that the disease was introduced with plants and seed imported from a restricted area in the Malines district of Belgium where the trees show the tendency to precocious fertility.

LANDALUZE (P. U.). **Hacia la solución del problema del Castaño.** [Towards the solution of the Chestnut problem.]—38 pp., 1 diag., 3 maps, La Coruña, Papelería e Imprenta Lombardero, 1936.

An account is given of the life-history and mode of infection of the ink disease of chestnut (*Phytophthora cambivora*) [*R.A.M.*, xv, p. 408], with observations on its distribution and economic importance in Spain and on the possibilities of its control. In the province of Coruña, the disease has reduced the number of chestnuts from 664,000 25 years ago to 104,000, while the values of the annual yields of nuts and timber, and capital represented have sunk, respectively, from 1,992,000 to 312,000, from 332,000 to 52,000, and from 46,480,000 to 7,280,000 pesetas [1 peseta = about 9½*d.* at par]. In many districts the inhabitants are reduced to destitution through the loss of this valuable source of revenue.

During the last two years promising results have been given by a preventive treatment involving the decortication of the trunks and thick roots, which are then washed with water, preferably with the addition of an adhesive, e.g., honey, calcium caseinate, or the proprietary product ipem, prior to spraying with copper carbonate. This economical method should also be tested against other root diseases, such as root rot of vines and fruit trees (*Armillaria mellea*) [ibid., xv, p. 75] and *P. citrophthora* [ibid., xiii, p. 25] on citrus, both prevalent in Galicia. The spread of *P. cambivora* appears to be largely impeded by very low temperatures such as occur in parts of Galicia.

Bramble (W. C.). **Reaction of Chestnut bark to invasion by Endothia parasitica.**—*Amer. J. Bot.*, xxiii, 2, pp. 89–94, 6 figs., 1936.

Details are given of the author's histological studies of the infection of the American native chestnut (*Castanea dentata*) by *Endothia parasitica* [*R.A.M.*, xiv, p. 800]. In agreement with the observations of earlier investigators, it was found that primary invasion of the bark apparently occurs through a cleavage of cells effected by mass action of the fan-shaped mycelial mats of the fungus, which accumulate in wounds before entering the surrounding healthy tissues. Secondary invasion is effected by individual hyphae which penetrate a few mm. in advance of the mycelial mats. The walls of the host cells lying in the path of the mats or adjacent to the latter become partially lignified, but this process does not appear to impede the progress of the fungus. In the bark of vigorous chestnut stems and also below hypertrophied or swollen cankers a wound periderm was observed to develop between infected and sound areas; this periderm differs from normal secondary periderm of chestnut bark in time of formation, the proportion of thin-walled to thick-walled cork cells produced in the phellem, and in the larger number of layers of cells constituting the phelloderm. Although the efficacy of the periderm is not yet fully determined, it is suggested that its formation may have a bearing on the resistance of chestnut to infection by *E. parasitica*.

Buisman (Christine). **Verslag van de onderzoekingen over de Iepenziekte, verricht in het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn gedurende 1935.** [Report on the investigations relating to the Elm disease conducted in the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, during 1935.]—*Tijdschr. PlZiekt.*, xlii, 2, pp. 21–44, 1936.

A tabulated account (preceded by some introductory observations on pp. 17–20 by Dr. J. Westerdijk) is given of the inoculation tests performed during 1935 at various experimental nurseries in Holland to determine the reaction of European and Asiatic elms to *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xv, p. 125]. On the whole, the results obtained with the European specimens were not very encouraging though further studies are necessary before a final verdict can be reached [cf. ibid., xv, p. 183]. Of the Asiatic varieties, *U. wallichiana* for the first time showed a trace of infection, whereas *U. pumila* maintained its high degree of resistance [ibid., xiv, p. 726].

C. ulmi was experimentally shown to pass from old to new wood only in a very few instances in the seedlings and suckers of *U. foliacea* and *U. glabra*, but in older trees the percentage would appear to be considerably higher [ibid., xv, p. 327]. The fungus was found to move with great rapidity through the wood of growing branches even of the resistant varieties, *U. pumila* and *U. foliacea* No. 24 (100 and 80 cm., respectively, upwards from the site of inoculation after 19 days); in cut branches the progress was noticeably slower, indicating that the water stream probably aids in the dissemination of the organism. It was ascertained by means of the fluometer devised by Melhus *et al.* for the study of water-flow interference in gall and vascular diseases [ibid., iv, p. 234] that the structure of the wood, even in resistant varieties such as *U. pumila*, presents no barriers to penetration by the spores of *C. ulmi*.

Spaulding (P.), Grant (T. J.), & Ayers (T. T.). **Investigations of Nectria diseases in hardwoods of New England.**—*J. For.*, xxxiv, 2, pp. 168–179, 1 diag., 1936.

An account is given of the results to date of the writers' extensive field and laboratory investigations, initiated in 1933 and still in progress, on the *Nectria* diseases of hardwoods in New England [*R.A.M.*, xiv, p. 338]. Perithecial development was found to be closely dependent on moisture relations. Both at 65° to 85° and 35° to 40° F. many more perithecia were produced and likewise became exhausted in a moist than in a dry state, the process of exhaustion being most rapid, however, when damp and dry conditions alternated. Even after a year in a dry atmosphere the perithecia may still contain viable ascospores.

Nectria cankers are prevalent on red maple [*Acer rubrum*], yellow birch [*Betula lutea*], sweet birch [*B. lenta*], and to a somewhat lesser extent on grey [*B. populifolia*], and paper [*B. alba* var. *papyrifera*] birches, sugar [*A. saccharum*] and mountain [*A. spicatum*] maples, red and black oaks [*Quercus rubra* and *Q.* (?) *velutina* Lam.] and largetooth aspen [*Populus grandidentata*]. In general, the fruiting of the *N.* species concerned is restricted to a limited area of the cankers, often on the callus ridge at the outer edge. The data from cross-inoculation experiments with monospore cultures from a number of hardwoods show that 'weed' trees, such as mountain and striped maple [*A. pennsylvanicum*], may be infected by inoculum from their more valuable neighbours, so that they probably act as agents in the dissemination of the disease.

In 1934 *N.* perithecia were found on 209 out of 1,785 beech trees (12 per cent.) examined in eastern Maine, the species involved being chiefly that described by Ehrlich (*N. coccinea* var.: ibid., xiii, p. 732]. Strong evidence was obtained that the maximum damage to the trees is generally inflicted by a combination of *Nectria* infection and scale infestation, but the correlation between these two forms of injury was not entirely uniform or consistent either in Maine, Massachusetts, or Connecticut.

Some practical silvicultural recommendations, based on the foregoing observations, are made for the control of *N.* cankers in the areas covered by these studies.

FINCH (A. H.). **Zinc and other mineral constituents in relation to the rosette disease of Pecan trees.**—*J. agric. Res.*, lii, 5, pp. 363–376, 1 diag., 3 graphs, 1936.

In experiments carried out in 1933 near Tucson, Arizona, on Burkett pecan [*Carya pecan*] trees severely affected by rosette [*R.A.M.*, xiv, pp. 538, 767], zinc sulphate was introduced through holes bored in the trunk or in various branches, and detailed chemical analyses were subsequently made of the leaves and shoots. The results [which are tabulated] furnish additional evidence that the disease is to a considerable extent associated with deficiency in zinc; the development of the symptoms of the trouble, however, may also be influenced by such factors as condition of growth, location of the tree, exposure to light and heat, and probably many more. While the total ash content of leaves collected from the top of rosetted and healthy trees in the Yuma Valley in 1934 was found to be higher in the former than in the latter, it could not be definitely correlated with rosette, since it is also markedly affected by other factors; the zinc content varied from a trace to 0·0071 per cent. and from 0·0084 to 0·0202 per cent., respectively. Ringing the tree did not prevent the passage of zinc, which must be translocated in the xylem; when introduced directly into this tissue it moved most rapidly in an acropetal direction.

OWENS (C. E.). **Studies on the wood-rotting fungus Fomes pini. I. Variations in morphology and growth habit.**—*Amer. J. Bot.*, xxiii, 2, pp. 144–149, 9 pl., 1936.

In this paper the author summarizes the results of his studies on the growth habit and morphology of the sporophores of *Fomes pini* (which name he prefers to *Trametes pini*) [*R.A.M.*, xiv, p. 67; xv, p. 472] collected from six genera and 21 species of coniferous trees in North America, chiefly in Oregon and other areas of the Pacific North West. Considerable variations were observed in the shape and size of the fruiting bodies (thin, shell-shaped to thick ungulate, ranging from 1 in. or less to 17 in. in the broadest dimension) and of the pore mouths (circular or angular to labyrinthiform, ranging from 0·25 mm. for the smallest circular pores to 2 by 9 mm. for the largest daedaloid pores), not only on different host genera and species but also on a single host species. Variations were also recorded in the size of the spores from different hosts; thus, for instance, on *Picea sitchensis* the spores averaged 5·1 by 4·6 μ, on *P. rubra* 4·4 by 4 μ, and on *Pinus monticola* ranged from 5·2 to 5·7 by 3·6 to 4·9 μ. On living trees in the Pacific North West the sporophores were always found at the branch stubs or knot holes on all the species of hosts investigated, except on *Abies grandis*, on which they occur gregariously in large numbers, scattered over extensive canker-like areas of the bark; in Oregon there was ample evidence that the sporophores on this species persist and develop new layers throughout several growing seasons, and on *Picea sitchensis* the sporophores are large and perennial. In variance with existing records in eastern North America and in Europe, no strictly annual sporophores of *T. pini* were observed in the Pacific North West on any species of host tree.

RUMBOLD (CAROLINE T.). **Three blue-staining fungi, including two new species, associated with bark beetles.**—*J. agric. Res.*, lii, 6, pp. 419–437, 10 figs., 1936.

In continuation of her studies on the blue-staining fungi associated with bark beetles parasitizing conifers in the United States [*R.A.M.*, xi, p. 340], the author states that *Ceratostomella ips* [ibid., xiv, p. 729] has now been found to be associated with the bark beetles *Ips emarginatus*, *I. integer*, and *I. oregoni*, which attack conifers on the Pacific coast. An account is further given of cultural studies of two hitherto undescribed species of *Ceratostomella*, which were found to be associated with the beetles *Dendroctonus pseudotsugae* on Douglas fir (*Pseudotsuga taxifolia*) and larch (*Larix occidentalis*), in Washington and Oregon, and *D. piceaperda* on spruce (*Picea glauca*) in eastern Canada, respectively. The first, which is named *C. pseudotsugae* [with a Latin diagnosis], has hyaline, globose, obovoid or clavate conidia, 2·7 to 5 by 1·4 to 2·7 μ, first solitary and later in clusters, on hyaline, usually unbranched conidiophores. The perithecia are black, globose, slightly hirsute, 45 to 140 by 42 to 140 μ in width, with a beak measuring 20 to 160 by 10 to 25 μ. The ascospores (eight) are hyaline, crescent-shaped, 2·4 to 5·4 by 0·9 to 2·4 μ. The second, *C. piceaperda* n.sp. [with Latin diagnosis], has erect, brown, branched conidiophores, 170 to 250 by 4 to 8 μ, bearing hyaline, obovoid or clavate conidia, 3 to 11 by 2 to 4 μ, aggregated in heads. The perithecia are black, globose, hirsute, 90 to 350 by 80 to 340 μ, with a beak measuring 110 to 980 by 25 to 45 μ. The ascospores (eight) are hyaline, ellipsoid, and measure 3·6 to 4·7 by 1 to 2·4 μ.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, October–December, 1935.—pp. 1–2, 1936.

An announcement (B.E.P.Q. 385, superseding P.Q.C.A. 320 (2nd revision) and Supplement No. 1), dated 1st November, 1935, enumerates (A) the barberries (*Berberis thunbergii* and its varieties) immune from rust [*Puccinia graminis*] in respect of which (as for *Mahonia* cuttings for decorative purposes only), no permit is required for inter-State movement between 13 protected States [*R.A.M.*, xiv, p. 672], (B) those sufficiently resistant to the disease for distribution under permit in the spring wheat area, and (C) those of species and varieties to be excluded from the latter on the grounds of susceptibility to black rust (i.e., any not falling within groups (A) and (B)).

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, x, 3, p. 54–55, 1936.

BRAZIL. An Order of 12th September, 1935, provides for the phytosanitary inspection of fruit crops by the Service of Plant Health Protection, which will issue certificates in respect of orchards found to be in a satisfactory condition. The Service of Fruit Growing, on which devolves the supervision of the harvesting, packing, embarkation, and certification of fruit intended for export, will authorize picking only in orchards certified by the Service of Plant Health Protection.